The Builder.

VOL. XXX.—No. 1545.

Canterbury Cathedral: the Fire and its Effects.

THE modern Canterbury pilgrim along the high-road from London at last reaches the

"little town,
Which that ycleped is Bob up and down,
Under the Blee in Canterbury way."

Or, in more prosaic language than Chaucer's, he finds at Harbledown the last ascent and descent in the road that is to lead him into the city,—in the valley of the Stour. In the course of that descent he probably reflects that his predecessors, in the days of quaint dresses, caught sight on the very hill-brow of the huge temple now hidden therefrom by pleasant planting. When the great pyramidal mass is suddenly seen, outlined against the green downs in the distance,—the central tower relieved against, let us say, the transparent pearly clouds lighted through by the early morning sun;—the spectator is on the produced east and west axis;—the building, seen from the raised road, and as rigidly symmetrical as a soldier at drill, with its exact balance approaching an architect's elevation more nearly than anything else in nature. Thus, he does not from this historic road get in the distance any indication of the something strange that, in the shape of a large, intensely black gap, attracts the attention of another wayfarer approaching from Sandwich;—when imitating in the main Cœur de Lion's (March, A.D. 1194) pedestrian method; but, in vagrancy of soul and freedom from traditional disciplinary peas, following the prospect-commanding footpath over the quiet sheep-haunted downs.

Passing eastwards along the broad gravel, skirting the trim grass spread round the south walls of the cathedral, the eastern arm is reached after going by the first transept, running north and south from the majestic Bell Harry Tower over the crossing. Five bays from the tower the second transept comes forward (about 10 ft. internally) beyond the well-pronounced western cross, and as tall and forcible as the choir itself. The cathedral, with these and other bold projecting masses, conveys on the outside the impression of immense internal area,—an impression hardly justified in the interior owing to the many differences of level; and, perhaps one may add, that the building rarely looks all its prodigious length, for which accidents of site and the comparative shortness of its western limb are of course also in part responsible. About in a line with the centre of the piers between the second and third bays, moving still eastwards from the south-eastern transept, the ridge of the steep-pitched, lead-covered roof which the eye has followed from the central tower, and down the transept and round to this point, suddenly ceases; and a ragged, raking line of leadwork, broken by some half-dozen blackened rafter-couples jagging out above, eventually meets the lead parapet about a bay and a half further to the east. A dark cavernous space shows itself when looked at from beyond the eastern wall of Becket's Crown. The two bays eastward of the south-eastern transept have their sides parallel to the axis of the building; then,—as all who have once caught sight of the inside of the choir will not fail to recollect,—the side walls begin to converge. As the chapels of St. Anselm and St. Andrew,—excrescent chapels beyond the choir aisle of the (shorter) older church,—were not to be removed, they "would not allow the breadth of the choir to proceed in the direct line." These converging walls last for two bays, when the present screen, forming, what we will call, the east end of the choir, is reached,—for two bays further the walls are ruled by the axis. A crook outwards of 6 in. each side corrects the passage, and we reach into the semicircular apsidal end (divided into five sections) of the Trinity Chapel. Practically, it is from the beginning of the bold convergence of the walls that the east part of the choir is roofless; the vault (not a roof, but a ceiling) of course, however, remaining intact over both choir and Trinity Chapel. From the Green Court on the north,—looking over the ivy-covered ruins of the Priory, and consequently from a greater distance,—the details are seen to be similar; but the eye, guided by the imagination, is able to fill in among the lines of that less angular perspective the missing 80 ft. of straight ridge, and to trace in air the sloping line of the semi-cone as it stood aforetime black against the morning sun.

Looking up inside the Trinity Chapel, the vaulting is seen to have absorbed some of the water profusely poured out above it. The *tas-de-charge* and the ribs are of Caen stone, the filling-in of clunch and Falaise tufa, whitened to a surface on the underside. The bosses, Pierced with cradle-holes,—one in the cross arch at the spring of the apse, and another a bay and a half westward,—happened to be well placed for the passage of the liquid lead dripping on the back of the vault from the blazing roof. On the rough decayed surfaces of the Purbeck slabs that occupy the site of the Becket shrine, fragments of the lead remain; but on the patterned pavement, the "Opus Alexandrinum,"—covering the floor immediately to the east of the present choir-screen,—there are no traces of the several pounds of metal that streamed down there. Through the holes further westward water came, sufficient to float over the surfaces of the polished Purbeck floor, and the steps of the altar; and alarmed the well-intentioned assistants into removing the altar, tearing up the altar rails, unlining the pulpit and throne, and seeking out the readiest means of sawing the fixed seats from their cills. The reliques of the Black Prince attached to a beam (over his tomb), at the level of the tops of the caps of the piers on the south side of the Trinity Chapel, were all taken down, and placed away in safety. The shield, chapeau and helm, surcoat, latten gauntlets, and leather scabbard, with the buckle and fragment of belt attached, have all been replaced in the position they have so long occupied,—a concession to the feelings of the very numerous visitors brought here by the circumstances and the holiday season. It is to be hoped, however, that the suggestion of Mr. A. Hartshorne will shortly be acted on, and a strong glass case, in the aisle of the chapel, preserve from air and moisture the perishing crimson velvet, brown with age, and the other perishable materials, that in about five years' time will for five centuries have been among the treasures of this cathedral; and are now the most ancient and complete remains of the kind in existence.*

The eastern end is said to have been filled with steam from water rushing through with and falling on the molten lead on the floor; and in time by every opening wood-smoke reached the inside of the building, filling all down to the west of the nave with a blue haze. The stained-glass windows on the north side of the Trinity Chapel—brilliantly lighted up from the outside by the fierce light above—and streams of luminous metal, 10 ft. in length, rushing down at intervals;—the whole, viewed from the south-eastern transept, is said to have been a scene of weird awful beauty.

Mounting and passing along the roof of the south-eastern transept, all that will stand by itself is seen still in its place,—charred timbers, bending parapets, &c. Of the roof over 80 ft. in length, by widths of 50 ft. to 35 ft., the few beams and fragments here and there, a mass of charcoal on the green below, and black powder profusely scattered on every lower roof, are the remains. The back of the vaulting is being covered with a strong cement rendering, so that this small model of rounded chalk-downs may throw any rain-water well into the hollows of the vault pockets. These,—never more than 5 ft. 6 in. deep below the backs of the vault ridges,—have little windows to light them (3 ft. 8 in. by 11 in.); and through these, now deprived of glass, the water will run out on to the aisle roofs. As the liquid metal ran down the vault slopes into the pockets, and formed a level floor when it reached these window-cills, it enabled fresh melted metal to find its way out on to the water tables of the buttresses immediately below; and further down (in parts 4 in. thick) on to the flying arches conveying vault-thrust to the outside of the aisles. Dropping tears in shining metal, knotted interlaced tails, and many another eccentricity, are here to be found, where fresh melted metal has run in among cooled and cooling streams. A solid cast-lead table raised out of one of the pockets is seen by a moment's calculation to weigh 1¼ to 1½ ton (in parts 4½ in. thick). It must be slit up into lumps not much over 1 ft. super. before it can be with comfort (and safety) conveyed to the hoist at Becket's Crown. The walls show 3 ft. 7 in. wide to the splay of the cornice, situated about 9 in. out from the face of the wall below. On the outer edge the wooden* lead-covered parapet stood,—from 3 ft. to 1 ft. 11 in. high where remaining on the north side, giving the awkward raking lines so judiciously replaced by the horizontal top in the reconstructed south-eastern transept roof. It was from the covering strips of the tops of these parapets that the stained glass windows ran their greatest risk. When the insides of the parapets were burnt, these long lead ribbons hung over and flapped to and fro. (Probably, however, not a score pieces of the glass have been knocked out by all the accidents.) When the parapets burnt through—the lead from the outer surfaces fell on window-cills, strings, hood-moulds, and aisle-roofs; bucketfuls of what looks like short lengths of the wire for silver filagree have been gathered from the lower levels. Inside the parapet two wall-plates carry heel-pieces (or sleepers) 7 in. by 6 in., projecting inwards 15 in. to 2 ft., according to position; inclined struts, 6 in. by 4 in., start upwards from their ends, forming "knees" at the bottom; rafters, 1 ft. 8 in. apart, are 7 in.

* It has been asserted several times recently that the reliques have clung to the beam undisturbed for centuries. This is, however, an error. The leopard (or lion) crest—of pasteboard, coated with plastic material, in which the shaggy locks are moulded—fell off the chapeau about twenty years ago, and was carefully re-connected. Twenty years ago the jupon was taken down and lined with leather, in order to keep it from falling to pieces. About forty years ago, when the Duchess of Kent brought the Princess Victoria to the cathedral, all were taken down, and placed so that the heir to the throne of England might touch and see in detail some of the personal and other reliques of one of the most famous members of her family.

* A suggestion by Mr. E. B. Denison,—"It would not cost much gradually to replace all the wooden gutters of the cathedrals with stone, and then such accidents would be impossible," is not without its practical value. Stone parapets have, however, not been contemplated in the roofs at Canterbury. The space from the front edge of the cornice of the choir (on the level of the top of the wall) to the starting of the roof-slope [12 in. above the cornice] is only 14 in.

by 5 in.; 4 in. by ¾ in. longitudinal battens, 3 in. apart, support the lead; collars and inclined braces complete the roof. The whole of the timber is oak and chesnut, and very dry.

Seeing thus the shape of the work,—the story of the fire in its best authenticated forms, seems very simple. A plumber and man on Tuesday,* the 3rd of September, were at 10·30 a.m. at work in the south gutter, over the Trinity Chapel. The tool-bag must have stood over the fourth pier eastwards from the transept, as the tools have been dug out of the lead in the pocket below. The fire began, however, somewhere between this point and the springing of the apse. The plumber, by the way, is stated on all hands to be a very steady, trustworthy man, seven or eight years in his present employ. A peculiar "whirring sound" inside the roof, led them to go inside, when they found three of "the knees," described above, on fire. The best conjecture seems to be that the dry twigs, straw, and similar *débris*, carried into the roofs by birds, and which it has been the custom to clear at intervals out of the vault-pockets, had caught fire from a spark that had in some way passed through the roof covering; perhaps under a sheet raised a little at the bottom by the wind; —the surface of the pocket at the spring of the apse was only 32 in. under the timber knee. After efforts to extinguish with water, with additional water fetched up from the crypt, and to "rub out" the fire with sail cloth,—the authorities were informed; the bell tolled; military, citizens, and fire brigades assembled. The fire had then run up to the ridge, and was giving out smoke and flame (about 11 o'clock). Air to feed the fire came from the various openings under the gutters, from the doors into the western roofs, and through the lead laps; the roofs were, however, so filled with suffocating smoke, that endeavours to reach the fire from the transepts failed. Then followed the efforts to obtain water,—effected at last by junction to one of the hydrants in Burgage-street in a direct line south of the choir; and the hose, about 700 ft. long, was carried over a wall and through gardens, hung up by ropes, and carried aloft. Mr. Andrews, superintendent of the cathedral gasworks, reaching—by ladder from the roof of St. Anselm's Chapel,—a dormer intended for access to the choir gutters from the inside of the roof, situated just by the west angle of the converging walls, entered with the hose (12 o'clock), and began to play on the most western portion of the flames, then licking along the upper part of the roof; and at once saw them yield to the water. Once the progress stopped, the beating back of the flame on the parts already alight followed. Another hose had played on the outer surfaces of the lead from the ground without any good result; but when carried (12·15) through one of the little windows mentioned above a useful additional stream was poured out. By half-past twelve the whole was seen to be extinguished. The south aisle roof was set on fire in two bays, but put out after only trifling damage had been done. Buckets of water on the pockets — containing charred smouldering timber,—kept all so well at rest, that (about 2 o'clock) an enterprising photographer was allowing the sun to depict a group ranged across the vault under the part-burnt roof. At 4 o'clock the authorities held the evening service, so as not to break a continuity of custom extending over centuries; and, in the smoke-filled choir, the whole of the chapter in residence in the proper Psalm (xviii.) found expression for the sense of victory over a conquered enemy.

Cathedral authorities, fire brigades, soldiery, and townspeople seem to have pulled together with the oneness of purpose proper on such occasions. With the ready gallantry, and great personal risks in all quick movements at such high levels, it is a matter of congratulation that absolutely no important injuries are mentioned.†

Mr. Andrews, who appears to have shown a cool determination in every way admirable, and whose entrance inside the roofs was evidently the turning-point of the story, was in no way hurt,—though melted lead, striking on the timbers, now seen covered with little shining patches, spattered from time to time round him and burnt his clothes; and though the scorching heat and the flame were driven westward towards him continually by the wind. No doubt, the set of this wind (blowing gently but steadily from the east) had something to do with the rapid passage of flame along the ridge after the covering was once broken. Almost directly after the fire was got under a strong wind sprang up from the same quarter.

What might have Happened, and What should be Done.

It may not be out of place to conjecture all the possible results, if—as can be imagined—no large quantity of water had been obtainable at the requisite level; and the flames had maintained an uncontrollable supremacy in spite of the creation of considerable gaps in the roofs, and other efforts. A strong wind and night-time may be assumed in order to select the most unfavourable conditions. The whole of the roofs as far as the central tower would have been destroyed: comprising those of the Trinity Chapel, choir, two eastern transepts, probably also those of the aisles and adjacent chapels. It is difficult to imagine an extension of disaster that would have affected any roofs further to the westward. From falling timbers, by evil hap,—the stone vaults being fractured in their filling in (perhaps leading to the fall of some complete sections),—fire would be communicated to all internal fittings; injury done to much stonework by flame; and—possibly by falling masses of stone and timber and heated metal—monuments and stone screenwork mutilated (comparatively little injury has, it is true, been done to stonework by the recent fire);—wall and other painting would run, under such circumstances, great risk of entire ruin. That such destruction would seriously affect the stability of the building does not appear at all probable; and it is to be noted that some considerable portion of the irremediable injuries would only happen in case of a more or less complete failure of the vaulting. The behaviour of the vault in the present instance will incline every one to regard with some satisfaction these incombustible substitutes for wooden ceilings, notwithstanding that they want the constructive unity and complete fire-resisting qualities of the Roman domes and the Celtic stone vaults and roofs. From this consideration, however, of extreme not-impossible consequences, sufficiently saddening to think of, we see perhaps more distinctly the absolute necessity of the provision of many available resources,—that shall, in all fair probability, always avert such worst results; and also the advisability of doing away altogether with, or at least keeping under the strictest control (with the use of more than ordinary precaution), all the obvious sources of possible beginnings of destructive fires.

Under the influence of the sudden shock the manifestation of some eagerness to visit some person, or body, or system with blame, and call them responsible, was naturally to be expected. It must also be confessed that, through the press, and in other ways, the ordinary desire to render everything secure to the remotest future after one horse has been abducted, has been very fairly manifested. While proper reasonable provisions and precautions are in so many instances neglected, most of us who have to deal practically with the preservation of buildings are ordinarily content, to limit ourselves to urging apparently elementary caution and simplest preparation in case of possible casualty. Knowing so well the natural tendency to inertia when all is going on as usual, one would wish on principle to avoid the risk of what always suggests the bitterest irony of fate,—when elaborate contrivance is left to depend, in process of time, on not-always-intelligent routine. But this need not prevent any one from seizing an opportune moment—to point out some of the sober, practical details that might well be lodged in the minds and in the practice, of those who have the care of important public monuments.

As no irremediable damage appears to have resulted from the recent fire, it is nearer sober truth than mere cynical candour to say, that the menace and the actual damage will have been of real service, if our public buildings throughout the country have the benefit of searching inquiries into their means of meeting similar calamity;—such inquiries being made with all the point and purpose that result from the still fresh teaching of the inexorable logic of facts. Deeming the thorough conservation of historical buildings an unmixed good, and no pains to secure it in reality too great, we (*mutatis mutandis*) regard the matter with something like the optimism of the insurance offices, which look for sure indemnification for any specially heavy losses in the more general contributions of the community to fire-funds, and an increased personal care.

It cannot be denied that if in any instance patching with solder might be excused, the old choir-roof at Canterbury was that instance. The framework,—judging by portions remaining,—in not too excellent condition, crippled in places and patched and strengthened,—the whole leaning westwards in a way needing no plumb-line for its detection;—the leadwork old beyond memory, and repaired with patches and seams of all sorts and sizes, and apparently of many dates;—it would seem that to deal with the weakest places, to limit the work to keeping out the weather by the simplest means, would not be a very unreasonable course. Necessarily the total replacement of such a covering as existed here (and exists on the north transept), would to any judgment be only a question of suitable time and sufficient funds. In the case of such an admirable rigid roof as (in the progress eastwards of roof-construction) was put, not so long ago, over the south-east transept, with its handsome timbering and framing and bracing; its 10 lb. lead gutters,—the leadwork now in the grey uniformity of early oxidation;—it is really difficult to contemplate in one's own time the need of repair of any kind. And, indeed, on a roof in such condition mere temporary repair of any weak place would probably never be proposed; a new piece of metal would be put in, and the old removed for recasting.* Even at an expense (as it would commonly be found to be) of several times the ¾d. per foot super. for labour and coals of a reported test experiment at Lincoln Cathedral, the gain in permanence alone would be sufficiently decisive,—where the aim was not to secure temporary serviceableness at the least cost, but the very best kind of maintenance.

But however desirable it may be that all leadwork should be thus replaced, it is to be feared that, even in the case of the most precious buildings, the custodians—in the exercise of their ordinary judgment—will rarely be able to dispense with the less thorough descriptions of patching. Most of us have times and again to do, not what we would, but what we can. But it *can* be a rule that unprotected fires and lights —open flame and fire of any kind—shall not be carried in any case into certain agreed-upon places; and such a rule should at once be made, and carried out on pain of instant dismissal of workmen infringing it. Not that workmen are the only people to whom the rule should apply! Must not most of us, who have poked into the holes and corners of buildings beyond count, cry *peccavimus* in our secret souls,—when we recall some of the incidents, say, of creeping in the night-time through belfry and passages, eventually to clamber out on to the starlit tower-top to view the sea's horizon, or the lights on the distant hills? Or, as we think of the roof-spaces, the boarding underfoot littered over with dryest accumulations,—it may be of centuries,—all powdered with the dust from the decayed surfaces of the wooden beams above? A candle wrapped in paper for the hand, and guttering at each sharp cross-air-current, and notebook and measuring-rod to manage,—have we not on occa-

* The fire that injured the choir finished by Prior Conrad (dedicated 1130), broke out 5th of September, 1174, a date that has been remarked upon by those who note odd (failures of) coincidence. To *that* fire we own the work carried on in the next ten years,—the dignified and elegant designs of William of Sens, and William the Englishman, recently imperilled. Dean Stanley, "Memorials," 4th edition, p. 23, does not pass without notice—what Langton (1221) had not failed to point out,—the *Tuesday* in the past history of this Foundation. On Tuesday (the 29th December, 1170,—4th January new style), Becket was murdered; on Tuesday (the 7th July, 1220), the "Translation" of his relics from the crypt to the new shrine took place.

† Perhaps the soldiers showed some excess of zeal when they cut and pulled up the lead of the west valley where the roof of the north-east transept abuts; and more still when they used the axe on the sheets next to Bell Harry Tower, 150 ft. west of where the fire was stopped. It was proposed, just before the success of the water, to take out the 20 ft. of ridge east of the transepts, and the portions of the roof extending therefrom down to the north-east and south-east valleys; and thus to leave the choir roof to burn itself out if need be. If one side had been stripped before the other, as the lead on each side approaches two tons in weight, this might have led to accident; and one bay or a part of a bay of the choir roof, now leaning well in that direction, would possibly have toppled over westward.

* In the old choir roof the sheets are prevented from slipping by bands (not unlike bow door-handles) carried round the 4 in. by ¾ in. battens (which are put 3 in. apart); the ends of the bands being doubled into the rolls. In the new transept roof, the sheets of lead are narrow and not lengthy;—clips at the bottom of the middle of each sheet hang over the battens, and straps soldered on each hand alternately of the back of the sheet at every 1 ft. 6 in. or 2 ft. of length are also carried over the battens, and nailed to them inside the roof with copper nails. The rolls are of course not on woodwork, but formed only by the bending up and wrapping over of the edges of the thick metal.

sion reflected (after our return) that we should have readily submitted to carry a Davy-lamp if need be, if only it had been put into our hands? Especially would the complete banishment of the plumber's fire-pot, in its ordinary unprotected form, be no little gain to the community at large; and often it may be said,—though the woes of private persons do not form part of our present subject,—would such a banishment be no small comfort to a worthy householder or owner. Viewing the lamentable, all too frequent, miserable destruction wrought by this apparently simple and innocent implement,—it would not, in last week's state of public opinion, have been deemed outrageous for insurance companies to obtain powers to prosecute and recover heavy penalties from any tradesman causing them loss by permitting such an unshielded fire-basket to be used. A little ingenuity and determination on the part of the leading plumbers would, without difficulty, secure the necessary amendment. Certainly the most scrupulous pains—pains rarely possible if the performance of a reasonable quantity of work in a given time is at all to be considered—could only succeed in rendering accidents somewhat more rare,—from this spark and lighted-wood shedding contrivance;—which, however carefully put under the shelter of a stone wall, must always have the control of its own conduct there, when mealtimes come round for the workmen. (The workmen at Canterbury have, it is stated, had for years past directions to put out all fires half an hour before leaving work for the day.)

We think a word or two may usefully be said in this place, as to assumed blameworthiness in this case at Canterbury. In the natural desire to select and if possible punish some one, which most of us share with Mr. Samuel Weller and other leaders of opinion, "the workman" was pitched upon at once, and credited, on convincing new evidence, with uniform culpable carelessness; this even, in some instances, improved into a mocking Mephistophelian satisfaction in the undoing of work already done. Like all class-characters depicted without half tints, this happily is only a caricature; and seems to involve also a misconception of some of the conditions under which much hard mechanical work is carried on. The absence of keen anxiety,—one of the happy results of habit and hard work,—would, if with difficulty acquired, be regarded by any well-disposed critic of human nature as a thing that a man should earnestly seek for; and this,—quite compatible with proper care,—is often mistaken by unthinking observers for heedlessness; really quite a different thing, too prevalent, no doubt, but not anything like universal. Indeed, what risks—in building scaffolding, in shoring, in special dangers of most building trades, are avoided, as by a charm, through the steady nerves, and almost instinctive decision of ordinary workmen? Who could wish that anybody should pursue his daily tasks with an habitual view of all possible consequences of every act? Is it not sufficient to remember that there are arguments that have shown us the blessings of our ignorance of futurity? In *this* instance, as we have stated the case above, the plea of mere misadventure may surely be listened to:—and, indeed, many an accident, however calamitous, might be accounted for without suspicion of criminal neglect:—a suspicion that we like the less when it goes the length of imputations,—aimed beyond the individual at the moral status of a large part of our people,—who probably are imperfect, and happily are not more thin-skinned than other healthy-minded people, but are not habitually wanting in all the qualities in which we of the middle classes take some pride for ourselves,—such as, among others, fair care in the performance of understood and undertaken duties, and a habit of considering at some stage or other that somebody or something has a right to be thought of besides ourselves.

On this head of prevention the question of the use of incombustible, fire-resisting construction should not be passed by without a word. It is probably not yet decided to renew the timber roof; and it will be worth argument at least, as to whether a construction suitable to the building could not be put up that should have fewer disadvantages than the wooden one. With the not inconsiderable spans, and the steep pitch, the special covering material, and some provision for force of wind, the construction cannot be a light one; no doubt a very costly matter in iron just now. Probably, by the way, a considerable weight in the roof is very advisable, if not absolutely necessary, in order to supply (being cleverly arranged) direct downward pressure on the piers that sustain the vaulting. We shall note with interest the decision that is come to in this case, a decision that would be a precedent in other cases; complicated as it is with many considerations—not among the least the question of the probable endurance of iron. The failure of galvanisation, once regarded so hopefully,* and the cost and at the same time incompleteness of protection from the air by painting, instantly come into the mind.

Whether a suggestion that has frequently been made as to the coating of the inflammable surfaces of timber with fire-resisting solutions is practically feasible, awaits experiments and tests. No doubt much would be done with such solutions if justified by sufficient expectation of useful result.

The isolation of large buildings, and their division into distinct thoroughly separated sections are matters too much neglected. Why should there be even a possibility in any case that the burning of the inflammable roofs of a choir should affect, through a central tower, the inflammable roofs of the abutting transepts and nave, &c.?

The next consideration to prevention is—cure; in the case of ordinary medicine signifying the expulsion of disease; in the case of an ignited building the putting out of the fire—in other words, water-supply. In this Canterbury instance, it would be slaying the slain to insist at any length—on the mistake that the dean and chapter made in not obtaining the benefit of the high-pressure water supply immediately on the completion of the city waterworks. The cathedral precinct has long been supplied with water for culinary and other purposes from a special water-supply; derived from a spring on the hill behind the barracks, about a mile distant, and carried by lead pipes to a reservoir near the Green Court, up 25 ft. or 30 ft.† From this, pipes are led into the crypt of the cathedral, among other places, and it was from these that the buckets were carried up the stairs in the north transept, at a run the whole way, in the early stages of the fire. The waterworks for the supply of the city have been opened two or three years. The water is obtained from an artesian well, sunk in the valley, and forced up to the reservoirs on St. Thomas's Hill, not far from Mr. P. C. Hardwick's well-known Clergy Orphan Asylum, on the road to Blean. These works are, it is said, arranged so as to supply 180,000 gallons per day, with continuous service, at a pressure of 70 lb. to the square inch. This will account for the splendid volume of water obtained when once the hose was fitted; and for the fact that the streams directed inside the roof, against the flaming ridge, burst upwards in columns, 20 ft. above it, although that ridge was nearly 115 ft. above the grass in front of St. Anselm's Chapel below. Of course, when a fire occurred in Sun-street, in the city, in November last, and was put out by means of this high-pressure service, the cathedral authorities noticed the matter at the December audit, and saw that the question of protecting the cathedral would deserve some consideration,—eventually giving instructions for hydrants round the buildings at the June audit. . . . . As we leave Mercery-lane, on market-day, and enter the Precinct by Christ Church-gate, and walk on in the long shadows thrown by the westering sun, and notice the black-robed peaceful visitants of the towers, decorously announcing their own approach in a gentle monotone, it is not over a mere two or three years that we seem to have slipped back as we entered this self-sufficient system with its central orb and planetary "homes of ancient peace." . . . . And we cannot expect these privileges without paying some price or other, considerable or inconsiderable; let us be satisfied in that a complete water-supply of the most thorough kind is now here assured,—as well as in every such building throughout the country where high-pressure service is to be had. Mains led to different points round the building; hydrants at selected spots; in each distinct section of the building a rising fire-main, with fire-cocks on every distinct story,—crypt, ground story, and triforium; all cocks and hydrants screwed to one gauge so as to be used with the hose of the neighbouring fire brigade, and provided as well with hose,—the greatest length of the section,—to be kept, with wrenches and keys, adjoining each fire-cock,—and special lengths for the hydrants:—these are among the cures that one looks at with satisfaction, once on a glance at, and times and again on a careful survey of, an important building. Sizeable cisterns always full, and an array of glossy leather buckets,—some filled for use,—are also pleasant to the eye. It is true, as we have observed above, that the inefficiency of an absolutely indispensable portion of a carefully and skilfully arranged system is the oddest of all practical satire. This has so struck our national imagination and sense of humour, that the horse and well-equipped vehicle and the forgotten or missing driving-rein have passed into a proverb. May the practice days of provincial fire-engine volunteers, and the case of a notable City of London building (the National Provincial Bank of England), supply illustrations of efficiency maintained by rehearsals. In the latter case, the architect has a special (and comprehensible) dislike to the accumulations of soot and mud that deface so many London buildings. There is a thorough system of fire-mains inside the building,—all sealed,—to be used only in case of fire (not for the purposes of ordinary supply). Once every three months the seal is broken, and in the early morning (or rather what we call late at night in ordinary thought and speech), the Portland stone front is played upon, till its old colour appears, and the grime has hastily accompanied the water-streams down the gullies. The water company officials seal once again all that they wish, and till the next time comes it is probable that hose is in its place and sound throughout, that cocks can be joined to hose, and that the old and any new officials will be able fairly to do their part in the routine,—if by chance a real performance should be necessary a couple of months after such a rehearsal. Such practice as this, if only with the effect of watering the turf, and washing a piece of the leaden roof of a cathedral, or making rainbows in its Green Court for the delectation of the lookers-on, would probably not be wasted time, water, and energy.

The provision of large cisterns, filled by special hoisting or forcing, and of bucket supplies, is of course all the more imperative in cases where a high level cannot be reached by the water-service; and perhaps it might here be suggested that in place of a Cathedral Dignitary presiding over the plumbers and carpenters, and keenly glancing at glue-pots and pans, in the course of repairs (or, as we should conclude, an Alderman in the case of works at an old Guild-hall),—it might be possible to keep attached to every large building a "water-supply man," who should be skilled in the extinction of fire, and on the alert, when he knows that fires and lights are being used, to secure conformity to rules. The splendid service rendered by Mr. Andrews at Canterbury, due to his intimate knowledge of the building, is the best possible case to show the value of an intelligent, muscular officer of the kind in question.

Not, however, to weary out "good intentions" by other details that might deserve attention in a more lengthened exposition, we may confess that most of us would be in the main satisfied if only special hazards were superseded and an efficient water-supply maintained. And we will not deny ourselves the satisfaction of hoping that,—when all panic and, to all seeming, all remembrance of the lessons of the recent fire have passed from the general public;—on the two heads we have named "prevention" and "cure,"—the Capitular Bodies, the authorised custodians of some of the most valuable of our national memorials, will have left a fair but critical observer no room for cavil.

* The galvanised iron covering to the roof of the chapter-house at Canterbury now shows, especially on the north side, red blotches of very considerable extent (put up a little over twenty years ago).

† Readers of Professor Willis's admirable "Conventual Buildings of Christ Church, Canterbury" (1869), will not need to be reminded that the subject of the waterworks for the supply of the Precinct,—from the earliest period to the present time,—has been considered and proved worthy of laborious investigation on the part of that distinguished writer. By some strange power in the author,—his reader is made to enter into the process of discovery and the unravelling of difficulties,—till every part of what at first sight looks like a collection of the dullest and most commonplace of mechanical details,—is found to be possessed of all the interest of a mysterious contemporary *cause célèbre*.

The Norfolk Fine Arts Exhibition.—The annual exhibition of the Norfolk and Norwich Fine Arts Association was opened on Monday, at the Crown Bank. The collection is quite up to the average of former exhibitions, and the local artists, and particularly the amateurs, show in strong force.

A NOTE AT EXETER.

THE restoration of the interior of the choir at Exeter Cathedral, now far advanced under the direction of Sir G. Scott, promises to be a very successful and conservative cathedral restoration. Those who only knew the interior under its whitewashed condition will find a new beauty in it now, in the delicate and harmonious contrast of tone formed by the unpolished blueish-grey marble of the clustered piers, and the light cream-white tint of the stone forming the arches and the superstructure. Almost the only new features, the only features for which no precise original was found, appear to be the screens north and south of the choir, in the western bays of the arcade. These occupy the place where a brick wall had been built during the dark ages (of architecture). Most judiciously has the hand of the restorer been restrained from any superfluous application of colour on the vaulting; and while we had occasion to notice, some little time since, with regret, the unhappy effect of the blue and gold colouring applied (under the same direction) to the roof of Gloucester choir, especially in reducing its apparent height, we here notice with proportionate pleasure the satisfactory and delicate effect of the simple lines of gilding with which the fillets of the vaulting-ribs are brought out, and which give just the requisite sparkle to the vault, lighting up its leading lines, and leaving the spandrels an expanse of pure untouched stone, illustrated only by shadow and air-tint. With the bright sunlight which illumined the interior on the day of our flying visit, it would be difficult to find anything more truly noble in effect than this interior as at present restored, with its large and grandly proportioned windows of the finest period of tracery, shedding a flood of light over the beautiful triforium and deeply-moulded arcade. The remains of the old glass, in one of the north clearstory windows especially, show how light-toned and bright glass such as this, with no heavy masses of colour, assists the aërial perspective of such a building. A beautiful result might be obtained if the whole of the large clear-story windows could be filled with glass of the same type, and on the same light scale of colour; and it would be a righteous work also if the parts of the east window, which are now filled with tawdry modern glass of the worst period of the Revival, were restored by a skilful and artistic hand in a style in keeping with the older portions. A like sentence might well be passed against the west window, which not only disfigures the cathedral, but is a means for the propagation of bad taste in a small way, being habitually pointed out by the ignorant custodians of the building as "a fine window;" concerning which it is sufficient to say that the date thereof is about the end of the last century. What, in the course of the restoration, is to be done with the episcopal throne,—that noble specimen of Mediæval woodwork? Let us express a hope that when re-decorated, as it inevitably must be to some extent, the same counsels which have already guided the rest of the work may prevail; and that colour, if applied, may be applied delicately; gilding used with a wise and cautious discretion; and that there may be no violent eruptions of red, blue, and gold, in unnecessary deference to Middle Age precedent. The small and beautiful late chapel adjoining the south aisle of the choir stands as a warning in this respect. This has been "restored" in point of colour, of which we are informed sufficient remains were left to form an exact guide; and what is the result? A tawdry mass of strong blue, strong red, and gilding splashed on in true gin-palace decoration style. If the designers of the original chapel really coloured it in this way (which we take leave to question), all that is proved is that they did not know the value of their own work when they had produced it. Slightly decorated by gilding, perhaps, and with the elaborate and delicate stone carving left to tell its own tale, this little apartment would be quite a gem (allowing for the decadence of the style); treated as it has been, it becomes vulgarised into a mere piece of coarse tawdriness. If walls are to be covered with colour at all, there is surely something more refined to be invented than these puerile efforts in two continually repeated colours and gilding. Why is a combination which even in a theatre, in the present state of decorative knowledge, would be accounted too strong and glaring to escape the charge of vulgarity, to be regarded as the normal scale of coloured decoration for a church, with its soberer and more solemnising associations? Those of the public who are maintained by modern-mediævalising fancies perceive the incongruity, we imagine, very plainly.

One regrets to find still retained at Exeter the system, now happily abolished in several at least of our cathedrals, which degrades these noble monuments into show-places, and leaves the visitor at the mercy of the half-educated official who insists on "showing him over," and telling him gratuitous architectural falsehoods—"gratuitous" only in one sense, be it understood. If the showmen at these places understood their own interests, instead of insisting that "nobody can go round without the verger," they would put up a tariff, "half-a-crown charged for attendance round the building, and five shillings for being let alone." They would get plenty of five-shilling "tips." But why do not deans and chapters put an end to this useless nuisance?

Except at the Cathedral, things architectural seem to be very quiescent at Exeter. The Church of St. Michael and All Angels, built three or four years ago from the designs of Mr. Hawkins, seems to be regarded as the point of attraction in modern architecture, of which the interior (arranged with narrow side aisles for passage only) is the best portion, and is solid and monumental enough in character, and satisfactory in the nature of the carved work (of French type); but the whole is rather too like an imitation of the manner of a more eminent modern Gothic architect. The treatment of the nave buttresses externally is good, but the tower and spire cannot be called a success, being at the same time weak in general composition and deficient in refinement of detail; the latter remark applying, indeed, to the whole of the exterior treatment. It is almost necessary to say so much, because it appears that the church is shown and held up in the neighbourhood as a model of modern church architecture,—which it certainly cannot be said to be. The new Albert Museum, not far from the Cathedral, is a creditable building in French Gothic, containing among other things a very well-arranged collection and classification of the building stones of Devonshire and one or two of the adjoining counties. The collection of birds is worth looking at, on account of the cases of splendidly-mounted specimens of falcons and some other birds, lent by an amateur, in which the birds, instead of being stuck formally on pedestals, are represented with great spirit and fidelity in their natural actions and attitudes,—flying, fighting, &c.,—somewhat after the spirit in which Audubon used to make his drawings of birds. One group is an exact and very clever copy of the picture of two hawks fighting for a teal, painted some years ago under the title, "Just Out,—the Tail of a Teal:" the artist's name has escaped our memory.

The Exeter railway station is so commodious and roomy that the traveller along this line is tempted to inquire why the same qualities cannot be extended to the construction of the company's carriages; more particularly when he contrasts the price paid for his ticket with the discomfort of his conveyance. The rates of fare are exceptionally high on the Bristol and Exeter line; the carriages, the second class particularly, exceptionally (we had almost said disgracefully) cramped, mean, and uncomfortable. Persons living mostly in narrow-gauge regions are wont to associate ideas of excessive comfort with broad-gauge travelling. The fact is the reverse; what is given in breadth is saved in length in the latter carriages, where the seats and the space between them are so economically narrow that all comfort is out of the question. A "London and North-Western" carriage is a paradise by comparison. As we are on a railway grumble, let us ask once more, what we suppose every one going through Bristol asks,—Whether there is anywhere to be found an important central station so egregiously and ingeniously inconvenient, comfortless, shabby, and dirty, as that of Bristol;—where the stations of three different lines are combined at three different angles to one another, one of them only to be reached by a scramble across a network of rails at an oblique angle; where the booking offices are hidden away in the most unlikely corners, with no indication of their whereabouts; and where all printed announcement as to which station is which, seems to be thought quite superfluous, and strangers to the place may be very thankful if they find their way by accident to the right spot just in time to see their train off. If this is not an "architectural" subject, it ought to be; for a place with such a meeting of railway traffic as at Bristol ought to have a new station, planned in an intelligible and reasonable manner.

BITUMEN, AND ITS PRACTICAL APPLICATIONS.

THE application of bitumen interests so many of our readers at this moment, that we have thought it desirable to translate some observations on the subject published in the *Bulletin de la Société d'Encouragement pour l'Industrie*, August, 1872:—

Bitumen has been known from a very remote antiquity. In ancient days, at Babylon, and elsewhere in the East, it took a place amongst building materials; but the mortars and cements, first skilfully elaborated by the Greeks and Romans, have found greater favour in modern times. After having been abandoned for ages, the application of bitumen to purposes of construction was revived about the year 1840. Bitumenous cements were then tried in France for covering footways and roofing vaults and arches. The success which attended these experiments attracted public notice, and cements of this description came speedily into vogue.

The rage for bitumen, and the bitumenous compounds, all and sundry, which made their appearance about this time; the impetus thus given to the trade, and its varying fortunes and deserts, are within the personal recollections of many of us. Briefly, besides the cements formed of native asphalte from the mines of Seyssel, and of bitumen from Lobsann, there appeared a multitude of similar compounds, made with spurious bitumens obtained from the refuse of the gasworks, which were foisted upon the public as equal, or superior, to native asphalte. The failure of most of these substances bade fair to ruin the new industry; but time and perseverance have shown the utility of certain of them, and we have now natural and artificial bitumenous cements, each having a recognised place and uses in construction. The success which attended the employment of asphalte as a covering for pavements and footways generally, naturally suggested its application to streets and roadways, and many unsuccessful attempts were made in this direction. Not until twenty years later was the difficulty practically solved by the formation of the roadways of "compressed asphalte," which now covers some five thousand running mètres of the Paris streets, and which our neighbours across the Channel began about the same time to use as a substitute in the streets of London for "macadam," of which they, like ourselves, had experienced the inconvenience.

Bitumen, which would appear to be the result of a subterraneous process of distillation of organic matter or of coal or lignite, is still involved in considerable obscurity as to its origin. Numerous theories have been broached to account for its formation, and impregnation with various matters found in combination with it. Moreover, chemically considered, it is a very complex substance, formed of various compounds of hydrogen and carbon. Just as fatty matters are made up of oleine and stearine, so bitumens consist of a highly carbonised solid substance, combined or amalgamated with certain essential oils of a more or less volatile character. When exposed to the air, these oils evaporate slowly, giving rise to the varying states — solid, viscous, and liquid—under which bitumen is found in nature. Originally, the terms bitumen, mineral-pitch, mineral-tar, asphalte, and the like, were applied rather vaguely to denote the degree of consistency of the material. At present, in accordance with the system of nomenclature proposed by M. Milo, in 1861, the term *bitumen* is applied to the bitumenous principle in all compounds of this class, whilst *asphalte* is restricted to those compounds of bitumen with calcareous matter, which form the basis of the cements in use for paving purposes, and the substance of the "compressed asphalte" now employed on our carriage-ways.

Bitumen is widely distributed in nature. It is met with in various states:—1. Free and unmixed. 2. In a state of admixture with quartzose sand or earthy matters. 3. Impregnating schists. 4. In a state of combination, or of more or less intimate admixture with calcareous rocks, in which state it constitutes the substance we know under the name of asphalte.

Springs of pure bitumen have been known from a very high antiquity; but those which would seem to have been formerly very abundant

are now much reduced, and their yield gets smaller year by year. Those of Judæa, which furnished the bitumen employed at Babylon, give scarcely any yield; that of Gabian, in Herault, which formerly gave 1,500 kilogrammes per annum (3,300 lb.), is now almost exhausted; and the famous "pitch fountain" at Clermont is well nigh dried up. It would appear, however, that in China the supply is still abundant. Near the Cape Verdes, the bitumen at times overflows the surface of the tide; and in certain places in the Holy Land it rises to the surface of the water in a sort of scum, which is drifted to shore by the wind. In the island of Trinidad, on the bed of an ancient lake-basin now dried up, are found masses of bitumen solidified by the evaporation of their essential oil or by the addition of foreign substances. Bitumen in a pure, unalloyed state, as it here occurs, forms, as we have said, the basis of all bitumenous cements.

At Seyssel, at Bastennes, in Auvergne, and in numerous localities in France, Spain, and Switzerland, may be found beds of sand impregnated with bitumen. These *mollasses* are generally in the vicinity of deposits of asphalte, most frequently below them. The bitumen is extracted from the sand by long boiling in water, during which process it rises to the surface like a scum. Lastly, bitumen, in a vaporous as well as a fluid state, appears to have made its way, under conditions at present unknown, into the marls, schists, and jurassic-limestone beds of the lacustrine epoch, in which it exists in a state of admixture, perhaps even of combination.

Bitumenous schists are extremely plentiful in the coal-basins of Autun (Saone-et-Loire), of Buxiere (Allier); and are also found in Provence, in Dauphigné, and doubtless in many other localities. Calcareous bitumen appears to be of rarer occurrence as it also is of greater industrial utility. In France, we know at present but of four or five deposits susceptible of being advantageously worked. The oldest and best-known are at Seyssel, Seyssel-Volant, the Val de Travers, in Switzerland, and at Maestra, in Spain. Latterly some deposits have been opened in Haute-Savoie, and several beds near Alais, which, in the excellency of the yield, bid fair to rival that of Seyssel or of the Val de Travers. Some trials have also been made in Auvergne, in the neighbourhood of Clermont, but the proportion of bitumenous matter in the limestone is too variable and uncertain hitherto to admit of its being worked to profit.

Bitumenous limestone, or asphalte properly so called, has the appearance of mortar. Its colour is chocolate, of a shade depending upon the proportion of bitumen contained in it. When broken, it shows a fracture of a lighter colour, such as a scratch with a knife leaves on the surface of chocolate in cake. The grain is fine, and a close inspection shows that each grain of limestone has a separate bitumenous envelope; each grain is thus parted from its neighbours by a coating of varnish, which varnish binds the whole together firmly in mass. In hot weather this varnish becomes soft and sticky, and oftentimes the weight of a block in itself is sufficient to cause rupture. In winter, on the contrary, the bitumen is dry, and the mass presents a remarkable degree of hardness and impenetrability. When heated on an iron plate to a temperature of 170° to 180° Cent. (338° to 356° Fah.) asphalte decrepitates and falls to powder.

The proportion of bitumen in asphalte ranges from 15 down to 7 or 8 per cent. Generally speaking, those from the Val de Travers and Haute-Savoie give an average of 12 per cent. Seyssel asphalte yields 8 to 10 per cent only. In the works in the department of Gard, which are in a series of superposed beds, the proportion varies considerably, but the percentage is uniform throughout each individual bed. The richest yield 15 to 20 per cent., and the poorest 7 to 8 per cent. But the proportion of bitumen even in the richest beds is not sufficient to cause them to soften in hot weather. When, after breaking the asphalte into 3 in. or 4 in. fragments, we heat it to a temperature of 130° to 140° Centigrade, it falls to powder, as we have before said; and if the temperature be raised still higher, the bitumen passes off in the form of a thick smoke. If, on the other hand, we cast the powdered asphalte into pure molten bitumen, it dissolves, so to speak, and as much as 90 per cent. may be added before the mass assumes a paste-like consistency. Upon this singular property is based the process of manufacture of bitumenous cements.

Formerly, Bastennes, in the Landes, and Lobsann, in the Bas-Rhin, supplied a sufficiency of bitumen in a fluid, or, at any rate, in a viscous state, for this purpose; but now the springs appear to be nearly exhausted. Pure bitumen can only be obtained by boiling the *molasses*, or bitumenous shales, for a lengthened period,—say, ten or twelve hours. This is the mode of procedure at Seyssel; but it is costly and incomplete, and the bitumen thus procured always retains a certain proportion of sand. Even at Seyssel, where the shale is in close proximity to a rich deposit of asphalte, the process has been well-nigh abandoned; and there, as elsewhere, the native bitumen has been given up for dry bitumen from Trinidad, dissolved in mineral tar, obtained by a second distillation of certain bitumenous shales found in considerable abundance in the department of Air.

To 800 kilog. (1,760 lb.) of Trinidad bitumen are added 250 kilog. (550 lb.) of mineral tar, and the whole is boiled, stirring well the while, for the space of ten hours. In this way we get what is called "refined bitumen," which now takes the place of that from Bastennes and Lobsann.

To form the bitumenous cements used for paving, &c., we throw into the molten bitumen aforesaid, by degrees, and stirring well the while, the fragments of asphalte reduced to a powder, either by the action of heat or by mechanical pressure. The latter method is to be preferred, as it precludes the possibility of the bitumen getting burned. 100 kilog. (220 lb.) of refined Trinidad bitumen will thus take up 1,400 kilog. (3,080 lb.) of powdered asphalte. After six or seven hours' cooking, the compound assumes a paste-like consistency, and is then run off into moulds bearing the trade-mark of the manufacturer. In this way are obtained the blocks in which asphalte is offered for sale. Formerly it was the custom to melt these blocks on the spot, with the aid of a portable furnace, and the addition of six or seven parts by weight in the hundred of pure bitumen. After melting, 60 to 70 per cent. of fine gravel was stirred in, and the mixture laid on hot. But the smoke and the disagreeable smell thus entailed were productive of serious inconvenience in the Paris streets, and latterly the cement has been amalgamated with the sand or gravel at the contractor's works, and brought to the required spot in covered conveyances, provided with small coke furnaces, for keeping the contents at the requisite temperature. The latter are stirred from time to time by means of an "agitator," worked with a rotary handle. The success which attended the use of bitumenous facings for footways naturally led, as we have already observed, to a desire to apply the material to carriageways equally, either in the form of concrete of small stones embedded in some bitumenous cement, or by flagstones, cemented together with asphalte. But, in each case, the alternations of temperature and humidity destroyed the setting, and the essays proved unsuccessful. Numerous other attempts proved equally abortive, and it was only after many long years of experiment that it was found practicable to form roadways of compressed asphalte, such as now covers over 40,000 square mètres of the Paris streets, and is rapidly coming into favour in England. It should be stated that, although the experiments at Paris were unsuccessful, at Seyssel and at the Val de Travers the roadways formed by the continuous droppings of fragments of asphalte have a smooth, homogeneous surface, very compact and very durable. This fact suggested the application of the material in its natural state, as in the roadways now laid with "compressed asphalte," as it is termed.

For this purpose the asphalte is reduced to a fine powder, and heated to a temperature of 130° to 140° Cent. (260° to 280° Fahr.). It is spread out in layers, of 2 in. in thickness, over a concrete flooring, and well compressed by ramming, until cool. It forms a compact mass, as homogeneous in its powers of resistance as the rock itself in its natural state. At first, the asphalte was pulverised, by breaking it into 4 in. to 6 in. fragments, which were placed on strongly-heated iron plates. This method was only applicable to the richest asphaltes, as that of the Val de Travers, and the bitumen often got burned in the process. Now-a-days it is pounded cold by a very ingenious mechanical arrangement, equally applicable to any sort of asphalte, so long as it contains 7 or 8 per cent. of bitumen. The powdered asphalte is placed within large horizontal drums of plate iron, revolving over portable furnaces, which, with the aid of a system of rails and turntables, can be run under them as required. When the powdered asphalte has acquired a temperature of 150° Cent. (300° Fahr.), the portable furnaces are withdrawn, and in their place covered trucks, with double sides, to retain the heat, are run in under the drums, to receive their contents, and to wheel them off for immediate use. The loss of temperature in the trucks is small, and on arrival at its destination the powder is spread out and rolled with slightly-heated rollers into the requisite state of pulverisation.

The success of the operation depends much upon the state of the weather. In cold, and particularly in damp, weather, the powder cools too quickly; it then binds well at the surface only, and when the surface goes the road is destroyed.

Very many roads which have been made or repaired in unfavourable weather have lasted a very short time. Now, in Paris, operations of this description are no longer performed in winter,—all alterations and repairs are deferred until the summer, the stopping of holes and the like being done provisionally with boiling pitch, until the weather will admit of their execution in a proper manner.

Roads formed of "compressed asphalte" are cheaper in respect both of prime cost and of maintenance than ordinary macadamised roads. They produce less noise, less mud, and less dust. The resistance to traction upon them varies much according to circumstances. In winter it is less than over a flagged road; in summer-time, on the contrary, it is greater than on a paved road. Their greatest defect is that they become very slippery when covered with a thin coating of mud; they should therefore always be kept clean swept. Their greatest practical inconvenience is, as we said, that repairs can only be effected at particular seasons.

THE TEACHING OF PHYSICAL GEOGRAPHY.

At the recent Brighton Congress the Rev. Edward Hale, of Eton College, read a paper "On the Place of Geography, Political and Physical, in Education." The author gave it as the fruit of long experience as a teacher, that the rudiments of sound education should form two branches, viz., human and natural philosophy,—the one taught by literature and history, and the other by mathematics, physics, and science. Geography, physical and political, should form an essential part of rudimentary education. He considered geography, in its broad sense, to be one of those elementary studies absolutely necessary to the proper study of the history of man and nature. Having been for many years a teacher of modern history, he had found boys absolutely ignorant of the commonest geographical facts, and, therefore, unable to understand the political importance of treaties affecting the boundaries of countries or exchange of colonies. It was not so obvious that physical geography should be the groundwork of science-teaching. All parents are aware of the inquisitiveness of children, and must have observed also how, after school life begins, this inquisitiveness seems to vanish. The author's opinion was, that it is generally stifled by the evil genii of Latin and Greek grammar. Its disappearance did not prove that it was dead: with warmth and gentle rains it sprouts afresh, and this stimulating power is afforded by physical geography. As soon as the first principles begin to be taught, *i.e.*, the phenomena of day and night, summer and winter, boys become interested at once,—the intellectual cravings of childhood revive and are being satisfied. At the end of the author's first lecture to his class on this subject, boys would remain behind, asking for further information, "Why is this?" or, "Explain this again." Instruction in physical geography, in the author's own practice, began with these astronomical relations of the globe. These lessons were followed by others on the first principles of heat, the effects of solar heat on the earth, the tides, winds, and currents, evaporation and rain, the first principles of geology, changes in the physical features of the earth, volcanoes, ice, rivers, the formation of chalk and coral, and the distribution of plants and animals. If, at first, the natural inquisitiveness of the boys is excited, at the end they feel their intellectual powers. They see how, from the knowledge of certain facts, the great laws of Nature are deduced; in short, the reasoning faculties are excited and strengthened. Boys who,

from some cause, are unable to appreciate the refinements of grammar, suddenly awaken, as it were, when first taught the principles governing the phenomena of Nature. A great moral good is effected in such boys. They are enabled to maintain that self-respect they were in danger of losing under the feeling of inferiority in other departments. An objection may be made against physical geography, that it is too discursive. The author admitted that a boy's training should be thorough, but this requirement was not injured by the study in question. The want of thoroughness is seen when boys are successively put through courses of astronomy, chemistry, mechanics, &c., anything like a thorough knowledge of which, within the time they are taught, being impossible. But the *principles* of such of the sciences as are necessary to the study of Nature may be thoroughly taught, and can be properly understood by a boy of fair intelligence. The author then described the method of teaching which he followed with his class at Eton, which consisted of about thirty boys. He gave them *no text-book*. Each boy has an atlas of physical geography; he himself drew his information from the works of Humboldt, Herschel, Tyndall, Murchison, Reclus, and, above all, the "Principles of Geology" of Lyell, to which he made his principal references. His apparatus consisted of wall-maps, photographs, and a microscope, to which he was preparing to add a small but good geological museum. He required each boy to bring a large note-book, with each page folded in the middle. Commencing his lecture by stating, first, its immediate subject, he dictated from his own notes an abstract of its first division, which each boy writes on one half of his folded page. He then enlarged on and illustrated his subject by facts, putting, at the same time, frequent questions to the boys. On the other half of their pages they make their notes, and, at the end of the lecture (lasting nearly three-quarters of an hour), he referred them to the authors and the chapters of their books which treat more fully of the subject. After every two lectures he requires each boy to bring an abstract of the lectures, and for this marks are given, with additional marks for good diagrams; and after every eight or ten lectures a prize is given to the boy whose aggregate marks are highest. He believed that some sort of field instruction would be a most valuable addition to his lectures, which should include the teaching of the use of instruments.

In the course of the discussion which followed, approval of Mr. Hale's views was strongly expressed by several speakers.

"DE LUNATICO INQUIRENDO."

MR. HOLLOWAY'S scheme for building and endowing a hospital near Windsor (of which illustrations of the first and second premiated designs have already appeared in our pages) will probably add a more than ordinary interest to Sir James Coxe's speech at a recent meeting of the Medico-Psychological Association, held in the rooms of the Royal Society of Edinburgh. Sir James Coxe (the president), it is well known, is a distinguished physician and a commissioner in lunacy for Scotland; he has also devoted the labours and researches of a long series of years to the important questions arising from the treatment of lunacy; and it is remarkable to find that his opinions are tending more and more in the direction that the results of asylum treatment, even in its highest phases, are not sufficient to cope with the portentous growth of insanity in our population. We have only room for one or two quotations, which, however, are deserving of attention, as coming from a practical authority:—

"After quoting a variety of statistics from the returns of lunacy in England and Wales, he said, on the whole, everything considered, I fear we must come to the conclusion that during the last twenty years medical science has not succeeded in effecting any increase in the proportion of recoveries, or any decrease in the rate of mortality among insane patients in asylums. What, then, is the object sought to be attained by the establishment and constant enlargement of asylums for the insane? The answer to this question involves the consideration of many important points. We have gradually become so accustomed to the extension of asylums whenever they are full, that few stop to inquire whether this is the proper course to pursue. But a little reflection will suffice to show that the institution of asylums is merely an expedient to counteract an evil which has its origin in remote and complicated causes. When the Lunacy Acts were passed, a belief was extensively prevalent that the establishment of asylums would powerfully contribute to check the growth of lunacy; chiefly by the numerous cures they would effect, and by the difficulties they would place in the way of the propagation of the malady. We have seen that this hope has not been realised, but that, on the contrary, the number of lunatics has been greatly increased,—partly through the more frequent occurrence of insanity, if we may so interpret the increase in the number of admissions, and partly through the predominance of admissions over discharges and deaths. Even if we adopt the latter cause as sufficient in itself to account for the increase in the number of lunatics, and regard their accumulation as simply the result of life prolonged through improved treatment, it is difficult to see in this explanation any adequate reason for the constant extension of asylums. The question still remains,—What have they accomplished towards diminishing insanity, either by repressing its growth or by promoting recovery? Of course, it is impossible to call in question the fact that a large proportion of the patients admitted into asylums are restored to sanity. But this fact, nevertheless, leaves totally unsolved the problem how far recovery is due to any special influence of asylum treatment, or simply to the recuperative powers which nature displays whenever the circumstance which produced the malady are removed or neutralised, wherever that may occur."

Sir James proceeds to deal with the common argument in favour of asylum treatment, that recovery follows in a much higher ratio in the cases which are admitted *in the earlier stages* of the disease. "It cannot be denied," he says, "that such is the case." And it is not impossible that the plain deduction, *that recovery was due to the removal* of the patient to the asylum may also be correct. "But it will be observed," he adds, "that this is an assumption, in support of which it is very difficult to bring forward proof."

"Nobody can tell whether recovery would not equally have taken place had the patient not been sent to an asylum, and had simply those other means of treatment been adopted which are resorted to in many other maladies—such as a judicious administration of purgatives, tonics, or other drugs, with proper regulation of diet, and change of scene and surroundings. On the other hand, when it is pointed out that recovery rarely follows the admission of chronic cases into asylums, it is impossible to doubt the fact. But when it is maintained that recovery would have followed had admission taken place at an earlier stage of the malady, we have here again an assumption which is beyond the power of proof. In admitting this assumption, we should be bound also to admit that all patients received into asylums in the early stages of insanity invariably recovered. But we know from experience that this is not the case. Even where there is no apparent organic lesion, where the malady manifests itself as simple excitement or depression, or where there is merely delusion without either excitement or depression, we find the malady not infrequently resisting treatment at however early a stage the patient may have been brought to the asylum."

Sir James Coxe does not, however, undervalue the usefulness of asylums:—

"Every one must admit that asylums, under the exigencies of modern social existence, are indispensable institutions. They meet a great want, and, moreover, they meet it, as a rule, in an admirable manner. Therefore, I beg it may not be supposed that I am arguing in any way against either asylums or their management. My purpose is to point out what I consider to be the proper sphere of these establishments, and to warn against their unreasonable use. I have often in visiting them been inclined to question the propriety of detaining certain patients. There was no doubt as to the existence of insanity, but there was, nevertheless, the doubt whether it was to such an extent as to necessitate continued detention. From the superintendent being of opinion that such was the case, or from other difficulties in the way of discharge, the patient was left. At a future visit I have found him [the patient] much more confirmed in his delusions, or more liable to excitement, or, perhaps, incoherent. This result, looked at from one point of view, would seem to confirm the propriety of detention, but from another it may be regarded as bearing out the doubt that was felt. One thing, at all events, was clear: asylum treatment had failed; whether treatment elsewhere would have been more successful must, of course, remain unknown; but it has always appeared to me very questionable reasoning to maintain the propriety of detention from its unsuccessful results. However, it is not uncommon to hear it asserted that even where asylums do not cure, they at all events improve and humanise. It cannot be denied that this is frequently the case; but, on the other hand, there is not wanting evidence to show that association with the insane has occasionally a degrading and deteriorating effect."

We should feel inclined to substitute the word "invariably" for "occasionally," in the last sentence, if Sir James means to signify that perfectly sane patients were compelled to associate with insane ones. But it is not clear that such is his meaning. Moreover, it is not asserted that such a deteriorating or degrading effect may or could arise from the contact of a couple of innocent lunatics. Under certain circumstances, indeed, we should fancy the association not only to be quite harmless, but actually beneficial! We remember hearing a story many years ago of a rencontre which happened between three crowned heads and a harmless lunatic, and which occurred during the occupation of Paris by the Allied troops in 1815. Three military gentlemen were walking one morning in the Jardin des Plantes, when its beauties were quite scientifically pointed out and described to them by an oddly-dressed and singular-looking personage, whom they supposed to be one of the under-gardeners. He dwelt with peculiar emphasis, it was remembered, on the beauties of the Indian trees,—the lotus, the palm, the banyan tree, &c.; and, after concluding his botanical survey, he turned to his audience and politely requested the strangers' names. "I am the Emperor of Russia," said one of the party. "Indeed! ah! and this gentleman?" "He is the Emperor of Austria," was the answer. "Oh! Must I also understand," pursued the singular querist, "that this gentleman is an Emperor too?" "No," replied Wilhelm, smiling (who then saw Paris for the first time), "I am simply the King of Prussia. But," continued his Majesty (with a touch of that grave humour which is characteristic of his race), "will you be so good as to tell us in return the name of our distinguished *cicerone* to whom we are at present so much indebted?" "*Monsieur mon frère*," replied the eccentric botanist, drawing himself up and laying his hand on his heart, "*Messieurs mes frères, je suis le Grand Mogul!*" Alexander of Russia, who frequently told the story afterwards, used to add that the Great Mogul was probably the happiest monarch of the four.

There is more in Sir James Coxe's valuable address deserving of study. Although leading strongly to the curative effects of home treatment, he nevertheless admits that "the great advantages of asylum treatment are its convenience and its economy." He is silent, as far as we observe, respecting the vital question of *dangerous lunatics*, and the method of their treatment; but the following observations are as valuable as they are just.

"There cannot be a doubt that the inspiration of genius, and the knowledge acquired from experience, will often point the way to successful treatment in specially difficult or obscure cases; but, as a rule, recovery from insanity is due far more to an adherence to the broad rules of hygiène than to any peculiarity in the treatment. In supplying abundance of food and clothing in providing comfortable lodging and bed, in giving proper attention to cleanliness, and in affording ample means of varied occupation and exercise in the open air, lies the great secret of the successful treatment of insanity. Purgatives, hypnotics, narcotics, and tonics are useful as auxiliaries; but a comfortable meal is the best of sedatives, and abundance of exercise the best of hypnotics."

So that it would appear, in Sir James Coxe's estimation, that the proper and most philosophical treatment of the insane,—like that of other helpless and dangerous increments of our population,—is more and more verging on the simple yet beneficent principles of public health.

SCHOOL BOARDS.

Erith.—The Erith School Board have appointed Mr. Herbert Ford, architect, for the erection of suitable buildings to accommodate 575 children, also residences for the master and mistress of same, at Erith, Kent.

Dronfield.—It was resolved, at the last meeting, that Messrs. Flockton & Abbott, architects to the Board, be requested to prepare the necessary plans and estimates for intended schools and master's house in Cross-lane, such estimates to include the reqnisite fittings and furniture for the school. It was also resolved that Messrs. May & Lucas be requested to examine the plans and estimates before they be submitted to the Board for approval.

Staplehurst.—This Board has held a special meeting, to consider in what way to deal with Mr. Bridge, whose tender for the erection of the schools, namely, 4,200*l.*, was accepted, out of six, although the Board were somewhat surprised to find the lowest tender exceed 4,000*l.* The Board have recently received four new tenders: the estimates are not to be disclosed until next meeting. It was remarked that there was a superfluity in the ornamentation of the adopted plan, which rendered it costly, to which it was replied that it was desirable to erect a school of which they might not feel ashamed, either internally or externally. Eventually a resolution was carried unanimously, to the effect that no tenders be opened, and that Mr. Lewis (the architect) be requested to obtain from Mr. Bridge the amount to which his tender would be lowered by the reduction of the ornamentation. It would then be compared with the new tenders, and should his figures approximate to them within a reasonable sum, his offer would be accepted.

Reading.—Two reports of committee were read. Amongst the subjects referred to were the following:—Plans of the new school buildings in Silver-street had been pronounced "satisfactory" by the Education Department. The alterations to the temporary school in Silver-

street required by the Education Department would cost about 25*l.*, and therefore the committee did not think it advisable to incur this expense. With reference to the new school proposed to be built at Erleigh, correspondence had taken place between the Board and the Education Department, and it was deemed advisable to postpone the whole question for the present. Twenty-two tenders had been received for the new school in Silver-street, and the following had been accepted:—Mr. Charles Waite, brick and slate work, &c., 926*l.*; Mr. A. Shepherd, carpenter's work, 392*l.* 15*s.*; Mr. Pecover, iron-work, 92*l.*; and Mr. Sumner, plumber's work, 78*l.* 10*s.*; total, 1,489*l.* 5*s.* The reports were adopted.

Southampton.—The Works Committee reported that after advertising for tenders for the erection of schools in Bevois Town, estimated to accommodate 700 children, the following had been received:—Messrs. Laver & Rowland, 3,595*l.*; Messrs. Bull & Sons, 3,627*l.*; Messrs. Reynolds & Eldridge (Brighton), 3,740*l.*; Mr. H. Sanders, 3,849*l.*; Mr. S. Stevens, 3,865*l.*; Mr. J. Nichols, 3,887*l.*; Mr. J. Crook, 3,920*l.*; Mr. Gambling, 3,950*l.*; Mr. Jas. Dyer, 4,045*l.* 10*s.*; Messrs. Martin & Son, 4,195*l.*; and Messrs. Dunkley & Son (Teddington), 5,290*l.* 10*s.* The committee recommended the Board to accept the lowest tender, viz., that of Messrs. Laver & Rowland. In respect to the site for a school in St. James's district, the committee instructed the Board's surveyor to bring up an estimate as to the cost of erecting suitable schools. Mr. W. C. Westlake moved the adoption of the report, and reminded the Board that the acceptance of the contract for the schools at Bevois Town would be subject to the approval of the Education Department. The amount was larger than they anticipated, but the rise in the price of material and labour had been recently very great, and accounted for a large portion of the increased cost. The proposition to accept the tender was then carried, subject to the sureties offered proving satisfactory, and the matter was referred to the special works committee.

Worcester. — The foundation stone of the Board's schools at Hounds-lane has been laid by the chairman. The architect is Mr. E. A. Day.

GLASGOW: STOBCROSS DOCKS.

WE understand that Mr. Taylor Shipley Hunter, of Edinburgh, has been accepted by the Clyde trustees, after much consideration, as contractor for the first portion of the above docks. At first, eleven contractors gave in offers, and from that number four were chosen to give estimates for alternative designs, when Mr. Hunter's, being the lowest, were accepted. Mr. Hunter engages with a somewhat gigantic work, but his previous experience with similar undertakings gives every promise of the Stobcross Docks being constructed satisfactorily. In 1859 he built the eastern harbour at Granton, near Edinburgh; afterwards the Queensferry Railways and Harbour; and, latterly, has been engaged in the erection of the Chickens Lighthouse, Isle of Man. It is calculated that it will take nearly twenty years to complete the whole of the Stobcross Docks; but Mr. Hunter has undertaken to execute the first portion in two years, at a cost of 160,000*l.* The foundations for the dock-walls are to be of concrete cylinders, while the walls are to be freestone, from the Craigleith quarries, near Edinburgh, of which Mr. Hunter is lessee.

THE ART OF GLASS STAINING.

IN one of the Cantor lectures, by Professor Barff, to which we referred in our last, the lecturer said,—I am about to speak to you on the subject of staining glass with metallic oxides. We notice a considerable difference in the ancient glass which adorns the old cathedrals of this and other lands, and the glass which was made some twenty or thirty years ago. We notice this difference in the blues and reds, but more particularly in the latter, and we ask frequently in what does this difference consist? I have already noticed this point, but it is now my business to go into it rather more fully. The texture of the ancient glass is very different from the texture of modern glass, and I shall give some experiments later on to show this, and you will need no further remarks, as the illustrations will speak for themselves. But when old ruby glass is examined, you find that there is a thicker coating of the colouring matter upon it than there is upon modern ruby. The ground of course is different, *i.e.*, the white glass—that I have already shown—and to that is owing, in great measure, no doubt, the lustre of the ruby. But it appears as if the operation of dipping and coating had been repeated several times—as if the glass ruby had been taken and dipped into the pot, and coated with white and ruby glass more than once. It appears as if the coloured coating had been put on the outside and not on the inside, and that after the glass had been dipped into the ruby it was again dipped into the white, so that strie of white glass are formed between the thin films of ruby glass. That would very materially increase the brilliancy of the effect produced by transmitted light. All the old ruby glass is remarkably thick, and, no doubt, in former times, those who made windows took the greatest possible care in firing their ruby glass, and a great deal depends upon the firing. I have here a disc of ruby which was lent me to-day by Messrs. Powell, in which we have portions of it perfectly white; but if this white glass is fired carefully it becomes ruby, and if this ruby, which is perfectly red on this side, is overfired, it becomes almost opaque. Great care is therefore necessary in firing ruby glass. In some instances glass painters, if they are not careful in using a flux with their painting colours which is sufficiently soft to run down before the temperature rises so high as to affect the ruby glass, spoil their ruby. Glass painters know that, in spite of all their care, this does sometimes happen, and that ruby becomes so dark with the firing that they have to reject it, and paint fresh pieces. I mentioned, I think, that ruby glass is usually coloured with sub-oxide of copper; it is also coloured with oxide of gold. I have here two specimens, which have been lent me, of ruby glass, obtained from the heating of an almost colourless glass. I shall show you those presently by the aid of the electric lamp, and you will see that one piece is colourless, whilst that which has been heated has become of a beautiful ruby colour.

Before leaving the subject of ruby glass, I must say one word about splashed ruby. As many of you, no doubt, are aware, there are some pieces of old glass taken from French windows, I believe, in which there is clear, white glass with dashes of ruby upon it, just as if the maker had taken ruby glass in a liquid state, and dashed it on the white glass. This is called splashed ruby. The way that can be imitated, and no doubt the way in which it was originally obtained is this. Portions of this copper ruby are broken up into small pieces and thrown upon the iron implement, which is called the *marbre* or *marver*, and which is used in the manufacture of flint glass. The workman then gathers white glass from the pot on the end of his blow-pipe, and rolls the hot glass on the marver; the small pieces of ruby adhere to it, and are softened by the heat. The mass is then exposed at the mouth of the glass-pot, and the pieces of ruby melt and become perfectly united with the white glass and spot over its surface. When the mass is in the proper state it is blown and made (as already described) into a disc or cylinder, and the spots by this operation become elongated, and produce the same sort of effect as would be obtained by throwing a red liquid obliquely on a sheet of white paper.

Another point to be noticed in connexion with ruby glass is that we do not always get a ruby colour with the oxide of copper. Sometimes the sub-oxide becomes oxidised into the higher oxide, and that higher oxide gives a green, not a ruby, colour; so that we get an intermixture of green and red sometimes, and also purplish and bluish tints. Specimens of these I shall show you by-and-by.

The blue glass which is considered by many to be so beautiful, this sort of purple blue, is stained with oxide of cobalt. I have arranged an experiment or two to-night, to show you how, by running down certain mixtures which we have here, the composition of which I will tell you of presently, we are enabled to obtain coloured glass. Of course, in so short a time we cannot obtain it in a state perfectly homogeneous; but, at all events, we shall be able to show you how blue glass is obtained. Green glass is coloured by various metallic oxides. For instance, even as I have already mentioned, in a certain state of oxidation, iron colours glass green, and the green colour of ordinary bottle glass is owing to the presence of protoxide of iron. Green is also obtained with other oxides of metals. We have here a beautiful piece of green glass, which goes by the name of signal green, because it is used for railway signal-lamps. It is coloured by the higher oxide of copper, the protoxide, not the sub-oxide. Oxide of chromium also colours glass green, and it has a very powerful colouring effect. Opaque greens are made with it for enamels, and some transparent greens; for if this opaque green be coated upon white glass, we have a similar effect produced to that which we have when the ruby glass is coated upon white: a coated green is obtained. Then, with regard to yellow glass, there are different kinds, which I shall show you presently. Some cold yellows are obtained with sesquioxide of iron, the oxide containing more oxygen than the protoxide. Another yellow is got by silver stain. It is said that the ashes of certain woods colour glass yellow. It is the iron contained in the ashes which, in the state of sesquioxide, imparts the yellow colour to the glass.

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Having spoken of the method of analysing colour, I must speak on the texture of glass, for this is a subject of immense importance. It is on the texture mainly, I think, that the richness and beauty of effect which we see in the old window glass depends. I shall have to show this by direct light, putting the various pieces of glass in front of the lantern, and you will see by direct light the difference of effect produced by the texture of the glass; and you will yourselves, I think, be able to see in an instant how very beautiful is that glass which is made according to the system which the ancients adopted in the manufacture of their glass. First, we begin with white. On putting a piece of common glass before the lantern, you see no change whatever in the light thrown on the screen; but now I will put a piece of Messrs. Powell's white glass, used for church windows, in front of the light, and you see how beautifully the light is refracted. And if you get this brilliant effect by passing the electric light through this medium, how very much more beautiful will it be when produced by the sun's rays passing through it. You notice these numerous luminous points all of which add to the brilliancy of the effect. Here is a piece of ordinary green glass, through which the light passes uninterruptedly. Here is another piece, on which I experimented just now, and you observe how brilliant it is. Now I will show you a piece of ruby glass, which will illustrate the point I mentioned before. You see there is a border to it, which is deep in colour, but the main portion of it is white, with small streaks of ruby in it. That is the disc which I mentioned had been fired more on one side than on the other, and I said that those parts of it which are now white would become ruby if they were cautiously fired. This is most interesting to me, because it supports the theory which I have held for some time past, in conjunction with many other chemists, namely, that it is not to the presence of the metal, as a metal in the regular state, that the colour of glass is owing, but to the presence of a metallic oxide. This is a subject which I will not go into this evening, because it would take us too far. Here is another specimen of ruby, which has also greenish, greyish, and bluish streaks in it. That is coloured with sub-oxide of copper, but, no doubt, some of the sub-oxide has become oxidised into the protoxide, which gives the green and blue colour. You remember the green I showed just now—a bluish green, the signal green—it is coloured by the protoxide of copper, so that you can quite understand how there are streaks of blue there, and how you get streaks of greenish blue and grey mixed up with the ruby colour. I believe it is owing to the presence of these different tints that certain of these rubies which are sold ordinarily, and some of those which are manufactured for stained-glass purposes, when tested by the prism allow other rays, such as a green and blue, to pass through them. Here is another very interesting specimen. You see what beautiful colours and forms there are upon this piece of glass. You will be astonished to hear what they are, and how they are produced. It is a piece of glass which Mr. Powell was kind enough to lend me, and which had been for many years in his stable at Clapton. It is a pane of common crown glass, taken out of the stable-window. It is perfectly smooth on one side, and colourless, but on the other side it is rough and very iridescent indeed. It looks like some of the glass vessels which are taken out from Roman excavations, or from the bottom of rivers. Its surface looks like opal, and most beautiful colours are

seen on it as you move it about. These colours must have been produced by the action of certain substances on the glass, carried as spray in the air, which were in the stable, and which were deposited on this window from time to time, through a long course of years. The action of these substances is such as to destroy the texture of the glass, or at least the texture of that surface with which they came in contact, and having seen this you will not have much difficulty in understanding how it is that, through a lapse of years, certain effects are produced by atmospheric influences upon the church windows, of which we are so justly proud, as representing a state of high art and sentiment in the Middle Ages.

A DRINKING FOUNTAIN FOR PATNA.

A DRINKING fountain has been presented to the people of Patna, near Ayr, and was opened the other day with some rejoicings and speeches. The fountain consists of a basement of polished grey Aberdeen granite, with two basins, into which the water flows through two metal spouts issuing from lions' heads. Above is a moulded plinth of Yorkshire stone supporting the shaft of the fountain, which is of polished Aberdeen granite, having a moulded band across the middle, with a carved shield, and arms a lion rampant. Above the shaft is a carved Gothic capital, with splayed angles, surmounted by an open corona in Yorkshire stone, carrying a carved conventional *fleur-de-lis*. The total height of the fountain is 12 ft. from the basement to the top of the finial. Upon the shaft, in incised and gilt letters, is the following inscription:—"Presented by A. Barclay Walker, Esquire, to the inhabitants of Patna." The design was furnished by Mr. Henry H. Vale, architect, Liverpool.

CLACTON-ON-SEA.

THIS picturesque watering-place seems to be rising into importance, and offers a field for investment. A commodious hotel, erected by a limited liability company, has just been opened opposite the pier, and pleasure-grounds are being laid out facing the sea. The nearest railway station is about five miles off, but omnibuses run in connexion with the trains, while the London and Ipswich steamers call daily. A narrow-gauge railway or a tramway, to communicate with the main line, is needed.

A number of new houses and cottages are already occupied, and a London builder (Mr. Snelling) has bought several acres of freehold land adjoining the hotel, and seems at present to be doing the chief building here.

THE TRADES MOVEMENT.

London.—The Carpenters and Joiners' Central Committee have paid their final strike dividend at the rate of 2s. 6d. a day, or 15s. a week per man. During the last week upwards of 350 signed the strike-sheets; but that total does not represent the number actually idle for the whole six days, as by a resolution of the delegates a man could for the space of a month come on and off the sheets at pleasure in the intervals of his being out of work. The strike began the first week in June with very nearly the same number as that which shared in the last dividend. The first dividend paid was at the rate of 24s. a week per man, the second 27s., and the third 21s. Then came the "lock-out," and with it a fall in the fourth dividend to 7s. 6d.; the fifth was 8s.; the sixth, 9s. (lock-out withdrawn); the seventh, 10s.; the eighth, 12s.; the ninth, 11s.; the tenth, 11s. 6d.; the eleventh, 13s.; the twelfth, 6s. (week after the settlement); and the thirteenth, 15s. The highest, therefore, was at the rate of 4s. 6d. a day, and the lowest 1s. a day. The payment of the last, it is said, has pretty nearly exhausted the treasury. What has hitherto been called "The Short-time Movement" will henceforth become a "Uniformity of Time and Wages Movement;" and the next business of the delegates will be to arrange for the machinery to extend the adoption of the agreement recently come to with the Central Association of Master Builders to employers outside that body. At last week's meeting three prominent firms in this category were brought under notice, viz., Messrs. Corbett & McClymont's, West Brompton; Adamson & Son's, Turnham-green; and Perry & Co.'s, Stratford. Deputations from the committee were appointed to deal with the two first. Messrs. Davis, Benny, and Matkin (secretary) were delegated to move Messrs. Corbett & McClymont's, and they returned with the report that in order to avert a threatened strike the firm had unconditionally accepted the terms of the agreement entered into with the Masters' Association. The shop has accordingly commenced working under the code of rules issued by the Central Committee.——A mass open-air meeting of the builders' labourers of London was held in Trafalgar-square on Saturday evening last, to receive the report of their deputations to the Masters' Association relative to the late dispute in the trade. It was estimated that there were fully 1,500 of this class present, and the proceedings, which occupied about an hour and a half, were characterised by good temper and order from beginning to end. Mr. Halloran moved:—

"That, in the opinion of this meeting, the small addition granted to the wages of the builders' labourers is not sufficient to enable them to support themselves and families; and this meeting of labourers pledges itself to use its influence, and calls upon all concerned to do the same, to extend throughout the London district the Builders' Labourers' Union, so that by our united strength we may be able to command our 6d. per hour."

Mr. J. Leicester seconded the resolution, which was passed by acclamation.

Oxford.—The stonemasons struck for an increase of wages, but the builders having since conceded their demands,—30s. a week,—the men have resumed work.

Beccles.—A meeting of carpenters was recently held, to discuss a demand made of an increase of 2s. per week on wages. The meeting was summoned by the workmen, but the employers were invited to attend to talk the matter over. The only employers who attended were Messrs. Pells and Woodroofe. In the course of the conversation it was stated that the present wages were 20s. per week for ten hours a day; and the reason the men asked for an increase was the advance in price of all articles of diet and wearing apparel. Mr. Pells and Mr. Woodroofe said they had no objection to give the increase if other employers did the same. The meeting was adjourned, that other masters might be consulted.

Birmingham.—It seems by no means improbable that there will shortly be a strike of great magnitude in the Midland colliery district. The Coalmasters' Association have had a meeting at Birmingham to discuss the demand of the men for a further advance of 10 per cent., and have resolved, it is understood, not to grant it. In consequence of this decision the men afterwards met and determined to tender notice to leave work in a few days. Should no settlement be come to, therefore, another strike appears inevitable, and about 20,000 men and boys will thus become temporarily idle!

Labour and Capital.—At a meeting of the Executive Committee on Labour and Capital, in connexion with the Social Science Association, held on the 3rd inst., it was resolved:—

"1. That the committee desire to congratulate the master builders of London and their workmen on the termination of the late strike and lock-out in their trade, on the restoration of harmony, and on the passing of the joint resolution of masters and men, to the effect that, if any dispute should arise in future, they will at once resort to those means of friendly conference which have in this instance proved successful. 2. That it is very satisfactory to the committee that the advice which they ventured to offer, in reference to the late strike and lock-out, immediately elicited from one of the parties concerned an expression of a willingness to adopt it, was soon in part carried into effect, and has now been fully acted upon by both parties. 3. That in the hope that a similar result will follow the tender of the same advice in the case of the London bakers, the committee, again taking advantage of their neutral position, respectfully but strongly recommend both masters and men to appoint an equal number of representatives, with full powers to meet in friendly council and to settle all matters in dispute; or, failing to accomplish a settlement, to choose an umpire, whose decision shall be final."

OPENING OF THE "BLACK BURGH," BRIGHTON.

THE Dyke-road tumulus, or black barrow, about four miles from Brighton, has been opened. In the long account of the excavations and their results given in the local *Herald*, it is stated that

"the pit itself was an oblong, 12 ft. long and 8 ft. wide, sunk about 2 ft. 3 in. in the chalk, and filled in with chalk rubble. The direction of the pit was N.W. and S.E. The first objects found in the chalk rubble were two bronze coins and some Romano-British pottery, about the level and top of the pit. The coins are, probably, Roman, and, together with the pottery, belong to the secondary interment. At 4 in. from the floor of the pit some Romano-British pottery, of similar character to that found before, was encountered, and on the floor of the pit, with its point to the east, lay a bronze knife-dagger. Slightly to the south of the dagger, a small food-vessel, of far earlier type, a bronze pin, and about fifty well-made flat beads, about three-eighths of an inch in diameter, apparently made of jet, were found. And then, while clearing the floor of the pit, a skeleton, with its legs drawn up, and resting on its left side, with the face in an easterly direction and the arms crossed, with the fingers towards the face, was discovered. The whole was so crushed by the superincumbent mass that it was only 2 in. thick. It would appear that a pit was cut in the chalk; that the dead chief was placed in a sitting position—his dagger, beads, and food-vessel placed by his feet; the earth was then put over him, and upon the surface of the filled-in grave a mighty funeral pyre was lighted; then the flints were flaked over the charcoal, and the mound raised above the level of the surrounding country. At a subsequent period the mound was opened to receive another man of mark."

One of the first things noticed at the opening was a cylindrical hole in the chalk, 1 ft. deep and 4½ in. in diameter; next, a similar but smaller hole, 6 in. deep; and then a leg-shaped hole, 1 ft. 7 in. deep,—all cut in the chalk. These were evidently artificial, and differed altogether from the pot-holes met with in the chalk. Nothing was found in them. Mr. Phené, who has written on the serpent mounds, considers that the leg-shaped hole is in some way connected with religious rites. That they are of common occurrence is proved by the fact that Canon Greenwell has found them in Norfolk, cut in the rock; and they are spoken of as generally associated with mound burials.

ALBERT MEMORIAL.

SIR,—While approving the several remarks of your earlier correspondents on the Albert Memorial, I would wish also to make a suggestion.

It appears to me almost an impossibility to examine carefully and with any amount of pleasure, the beautifully sculptured bas-relief round the podium of this magnificent monument on a fine day, the eye becoming extremely wearied with the glaring brightness of the marble. This I believe might be entirely counteracted by having evergreens and flowers placed in pots on the upper landing within the low railing, and just below the statuesque panorama of past art-masters.

The green colour of the plants would also enliven the present plain and severe lower part of the Memorial, and help to harmonise the same with the gorgeous upper portion.

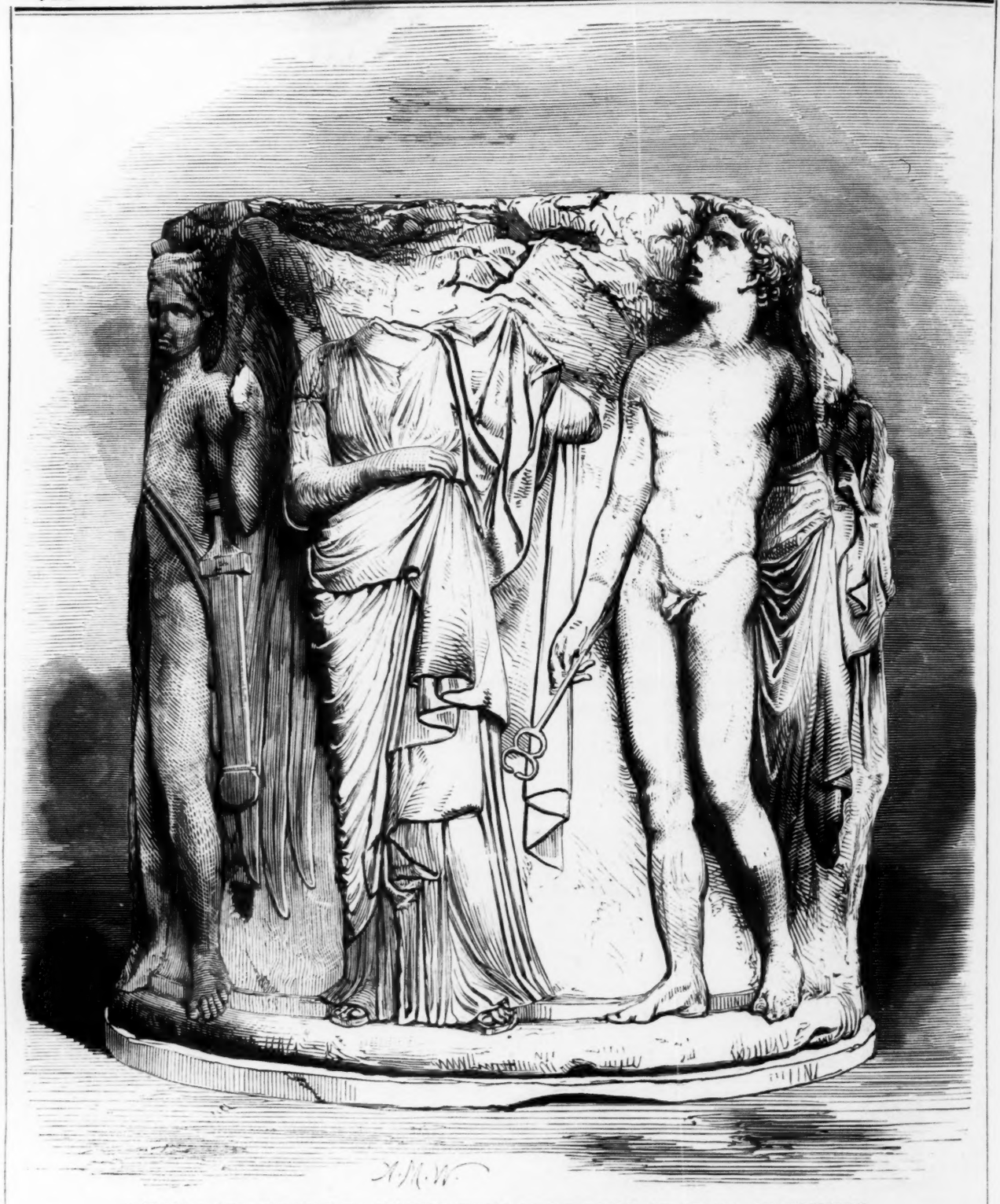
F. N. R.

THE SCIENTIFIC AND MECHANICAL SOCIETY, MANCHESTER.

SECTION I.—ENGINEERING.

AT the last meeting of the above society, Mr. A. Hildebrandt moved a resolution,—"That a special committee be appointed to take into consideration the society's future programme, and to make the necessary arrangements of carrying out the same." This committee to draw up new rules, to organise additional sections to their own, representing the staple industries of the district in all its most important branches, similar to the well-known "Société Industrielle de Malhouse," to consider the advisability of taking immediate steps for the establishment of a "Technological Reference Library and Reading Room," and the publication of the society's proceedings. He thought they were now in an unsatisfactory position, and their future line of action required mature consideration, which would bring about a radical change; they had now men of all shades—as regards professional pursuits—in their midst, and they had found by experience that it was not exciting sufficient interest to let them all meet at one time, and join in one common discussion, except by their own desire. For the next session he hoped there would be a section of chemistry, another for spinning and manufacturing, &c. If they looked upon that eminently useful and authoritative body, the Société Industrielle de Malhouse, it was difficult to understand that a similar movement should not have been set on foot in such an important centre of industry as their own district long ago. It was for them to decide now whether they should set themselves the task of exploring that field, clear as it was that there was ample scope and an urgent want for such an extension. He hoped that those gentlemen who wrote to the *Chemical News*, advocating a similar movement, would consider that they possessed the nucleus for it, and would co-operate with them.

A committee with full powers was then elected, consisting for the present of Messrs. Ziffer, Ross, Lynde, Spriggs, Tolhausen, Waterford, Driefuss, Huhenhausen, Hilton, and Hildebrandt, the hon. sec. of the society. This committee is to commence its labours at once, and the results are to be laid before and sanctioned by the next monthly meeting on the 2nd of October, so that everything may get in proper working order for the next session.



PORTION OF SCULPTURED COLUMN FROM THE TEMPLE OF DIANA AT EPHESUS.

THE TEMPLE OF THE EPHESIAN DIANA.

EARLY in the year we gave the public the first view they had had of the lowest frustum of a column, with its base-mouldings, as found by Mr. J. T. Wood on the site of the Temple of Diana in Ephesus, together with an elaborate essay on the probable form of the Temple, and a plan to illustrate it.* This large and interesting relic is now in the British Museum, open to all, together with a grand Ionic capital and other important remains, one of which we illustrate in our present issue. The width of the capital is about 8 ft. 8 in. on the face of the volutes. In the essay referred to, our classical readers were reminded of the account of the temple given by Pliny. He states (xxxvi. 14), that the height of the columns was 60 ft. and the weight of the epistylia,—the architrave stones,—enormous; the number of columns he gives as 127, "made by as many kings," of which thirty-six were, he says, *cælatæ* (sculptured in relief), one being by Scopas. Scopas, let us note in parenthesis, executed one side of the tomb of Mausolus. The temple which is now being exhumed, and with which we are concerned, was in process of completion, as we have before mentioned, when Alexander passed into Asia, B.C. 334, in succession to one that had been set on fire on the night of his birth, B.C. 356. Well here we now have a part of one of these columns sculptured in relief, as sent home from the site by Mr. Wood. It is the lowest portion of a column, of marble, about 7 ft. in diameter at bottom, and 6 ft. in height. Our engraving represents one side of it, and shows a female figure between Mercury and a winged Victory. Further round is another upright female figure, with the lower part of a seated female. The drapery of all the figures is admirably modelled.

It was a glorious find, and is of itself worth all the money that has yet been expended on the work of excavation.*

Amongst other remains now in the Museum, are part of a pilaster, also sculptured, the subject being "Herakles [our old friend Hercules] struggling with a female figure;" and the lower part of two figures, one sitting, the other standing close behind.

We conclude that these important and deeply-interesting relics will be all brought together in due time. At present they are somewhat scattered. We must repeat the expression of our hope that Mr. Wood will be liberally assisted in the further prosecution of his researches.

* See pp. 103 and 119, *ante*.

* Messrs. Mansell & Co. have published three excellent photographs of the sculptured drum of column, to which we gladly point attention.

THE BOSTON AND LOWELL PASSENGER STATION: BOSTON, U.S.—MESSRS. L. NEWCOMB & SON, ARCHITECTS.

THE BOSTON AND LOWELL PASSENGER STATION, BOSTON.

THE railway station which is in course of erection in Causeway-street, Boston, U.S., has a frontage of 205 ft., and extends back 700 ft.; what is there called the Head-house having a depth of 120 ft. out of this. It is modern Franco-Italian in style, and was designed by Messrs. L. Newcomb & Son, architects, under whose superintendence the work is now going on.

The material will be of face-brick, with trimmings of Nova Scotia stone. The central portion projects 18 ft. 4 in. from the line of the front, and is 54 ft. 8 in. in width. This central projection is crowned by a "Louvre" dome, the summit of which is 115 ft. above the street-level. In front of the dome the stonework rises in four pillars, forming a window, above which is another conspicuous projection, containing a large clock. On either side of the window is an ornamental circular window, and a similar one is on each side of the dome. At each of the four corners of the head-house is a tower, 35 ft. by 30 ft. Three of these are uniform in height, while the fourth, at the corner of Causeway and Nashua streets, rises to an altitude of 165 ft., the brick and stone work rising two stories above the main structure, and above all is a mansard roof. The towers, dome, and roof are all surmounted with cast-iron crestwork. The first story is finished in rustic stonework, and the bases of the towers are bastioned, and have a considerable inward slope, giving them a strong and substantial appearance. In each side of the roof, between the towers and the dome, are circular windows, corresponding to those in the dome, and just above is a row of smaller ones. In both of the Causeway-street towers are arched entrances, 40 ft. wide, communicating with covered driveways, open on the side, supported by pillars, and extending back to the towers in the rear. The archway in the tower at the corner of Nashua-street is for inward, while that on the other is for the outward, passengers. The driveway is 20 ft. wide, and is to be paved with wood. The rest of the space is to be occupied by a tiled sidewalk, 12 ft. wide, next the main structure.

From the side-walk, roomy entrances will communicate with the great central court of the interior, 92 ft. long by 52 ft. wide, with a height of 64 ft. 6 in., and ceiled with ornamental glass-work. The floor will be of tesselated marble, and in the centre will be a fountain, while all around will be comfortable seats for the accommodation of the traveller. Around the sides will be a double row of corridors, corresponding with each story, giving a view of the scene on the floor. In the arches of these corridors will be chandeliers, and at night the scene will be one of much beauty. The woodwork of the entire interior will be of brown ash, relieved by black walnut; and, in the great court, the prominent points will be brought out in variegated colours. On the west side of the court is the gentlemen's waiting-room, 39 ft. by 40 ft., with barber's shop and closets adjoining. Beyond is the telegraph office, and then comes the vestibule leading from the side-walk to the court.

This vestibule is 19 ft. wide and 40 ft. long. Here are the broad and easy stairways leading to the story above. On the opposite side of the building is a vestibule exactly similar in every respect. The outward and inward baggage-rooms are in the rear of the vestibules. To the east of the court is the ladies' room and a large dining-hall. But the unique feature is the ladies' private reception-room, immediately in front of the court, and occupying the central projection. Its dimensions are 52 ft. by 34 ft. It will be fitted up in a luxurious manner. A handsome carpet will cover the floor, and the walls will be adorned with paintings. The windows will be hung with heavy drapery. This room communicates with the ladies' waiting-room, spoken of before, which will have a private restaurant attached.

In the second story on the left is to be a suite of rooms for the manager, including a public and private office; and in the rear will be rooms for the treasurer, with a large fire and burglar proof vault, 9 ft. 8 in., by 6 ft. inside. Directly over the ladies' private reception-room is a large room fitted up for the reception of gentlemen wishing to see the officers of the road on business. On the right are the superintendents' rooms, and in the rear is the attorney's office, with law library attached. All these rooms communicate with the corridor running around the great court. This corridor is 12 ft. 8 in. wide. In the third story is a similar corridor. In this story are the directors' room and three large banquet-halls, so connected by folding-doors that they can be thrown into one large apartment. The rest of this story is occupied by rooms for the various clerks of the road, and the civil engineers' room. In the Mansard-roof story is the kitchen, which is to be connected with the restaurant by a steam elevator. The basement will contain the steam-heating apparatus.

The great train-house is 580 ft. long, and has a span of 120 ft., but there being lean-tos 40 ft. wide on either side, the total width will be 200 ft. In the main part will be four tracks: two in the centre 12 ft. apart, and one within 6 ft. of each wall, giving large platforms 40 ft. wide between. Then in each lean-to will be a track close to the inner wall, and outside will be extensions of the drive-ways and side-walks from the front tower entrances. The side walls are to be 16 in. thick, while the rear wall will have a thickness of 20 in. The rear elevation is of ornamental design, and contains three large rose windows, The great iron trusses supporting the roof spring from the ground 25 ft. apart, and describe a Tudor arch, rising to the height of 74 ft. A monitor ventilator, 22 ft. wide, runs the entire length of the roof. The roof, for 20 ft. each side of the elevation, is to be of heavy ribbed plate-glass, set in sashes of iron, to light the interior. The rest of the roof is of wood, covered with tin and again with corrugated iron. The roof will be painted in parti-colours; the woodwork of one colour, and the iron truss work in strong contrast.

THE HORNSEY DRAINAGE WORKS AND THE CONTRACTORS.

THE Hornsey District Board of Works are making strong complaints against the contractors for the drainage works at present in progress, not going on with them as rapidly as is desirable.* At last week's meeting of the Board the chairman stated they had extended the time to complete the works four months beyond that originally specified, and if more activity were not shown they would be into the winter months and still the drainage incomplete. In answer to these complaints the contractors state that they are doing their best against many trials with which they have to contend, and in a letter to the clerk they observe "labour is very scarce; in fact, we cannot obtain more than 100 men up to the present time." It was ultimately resolved that a letter should be written by the clerk to Mr. Latham, the engineer, calling on him to insist upon the drainage works being more rapidly carried on.

* These complaints forcibly illustrate the present state of the labour market, and the difficulties which contractors and others have to encounter in obtaining men.

THE MANCHESTER TOWN-HALL CONTRACTS.

THE proceedings of the General Purposes Committee of the City Council (as reported in the city *News*), having been submitted for approval,—

Councillor Stewart moved an amendment that they be approved with the exception of the resolution under which it was proposed to give the whole of the contracts for finishing the new Townhall to Messrs. George Smith & Co., the general contractors, without offering the work for competition. He had looked carefully into the matter, and he could not see that sufficient reasons had been assigned by the architect for his recommending that course. In his report the architect spoke of the floors not being proceeded with until the roof was on, but it appeared that both of those departments of the work were in the hands of Messrs. Smith, and consequently could not interfere with the work of other contractors. He (Mr. Stewart) was informed that Messrs. Smith & Co. did not do all the work themselves, but sublet it to other contractors; and if so, that fact entirely disposed of the architect's remark that Messrs. Smith could not well make room for other contractors. Messrs. Smith recently tendered for an insurance company's building in Albert-square, the amount being 9,795*l.*, and the work was let to Messrs. Thomas Clay & Sons for 7,400*l.*, showing a difference of 2,395*l.* in a small contract of that sort. He thought it was fair to assume, then, that the schedule of prices to be sent in by Messrs. Smith for the remaining work to be done on the Townhall might amount to 40,000*l.* or 50,000*l.* more than the work could be done for by others. With regard to the delay which the architect said would occur if Messrs. Smith did not get these contracts, he had consulted several well-known builders, who assured him that no more delay need occur through other contractors being engaged than if Messrs. Smith did the work, because, if the work were let this week to somebody else, it would take nearly all the time between now and the completion of Messrs. Smith's present contract to get ready for going on with the other contracts.

The amendment having been seconded, Alderman Heywood (chairman of the New Town-hall sub-committee) said the keenest consideration had been given to this question, and the committee would not have come before this Council with this proposition if they had not felt convinced that, under all the circumstances, it was the right course to adopt. No doubt, as he had said on a former occasion, the course suggested by Mr. Harwood and other gentlemen was the popular course pursued in the erection of large buildings, but he maintained that in this case there were circumstances which took it out of the category of the ordinary condition of things. Mr. Stewart had given them the opinion of several builders as to what could be done, but he (Mr. Heywood) did not think the Council ought to take that expression of opinion against what they had heard from their architect. He thought it was a very unusual course of procedure for Mr. Stewart to make the comparison he did between the price of a certain work contracted for by Messrs. Clay & Sons and the amount asked for by Messrs. Smith. If Mr. Stewart would consider the position in which Messrs. Clay were placed by tendering for that work as compared with Messrs. Smith, he would see that, though it might appear an argument to his advantage, it was really no advantage at all. He thought he might fairly say what would have been the course adopted by the Council had Messrs. Clay & Sons' contract for the new Town-hall been very near that of Messrs. Smith: the Council would have felt that Messrs. Clay ought not to be removed from the foundations. If, then, there should be any feeling at all in this matter, he did not see why it should not be in favour of Messrs. Smith, who had laboured hard to fulfil the conditions of their contract, and to erect a building which, he believed, could not be excelled throughout the length and breadth of the country. It had not been argued that Manchester men were not to execute the work which had yet to be done, nor had it been said that they would not do it. It had been said that Messrs. Smith were foreigners, and were coming to take the work out of the Manchester contractors' hands; but such was not the case, nor likely to be.

A division was taken on the amendment, with the following result:—for the amendment, 30; against, 20; the amendment was therefore carried.

STOWMARKET CORN EXCHANGE.

THE following tenders for rebuilding the Corn Exchange, Stowmarket, Mr. Frederick Barnes, Ipswich, architect, have been received:—

Andrews	£1,410 0 0
Gibbons	1,360 0 0
Saunders & Son	1,340 0 0
Smith	1,334 0 0
Cunnold	1,237 0 0
Girling	1,229 0 0

The last was accepted. The internal dimensions of the hall will be 80 ft. by 37 ft., divided into seven bays in the length. The roof will be carried by six cast iron elliptic arches and columns bolted to the side walls. To avoid as much as possible obstruction to the neighbouring property, the height of the walls will be only 20 ft.; but a lanthorn in the form of a clearstory, lighted on each side, extends the length of the building, framed over the iron arches, thus obtaining a height of 32 ft. from floor to ceiling, the crown of the arches being 26 ft. from the floor. Each bay in the length will have a triple circular-headed window 10 ft. high on each side wall, thus obtaining ample light.

The interior of the walls will be faced with the white bricks and red strings and arches, pointed. The lighting and ventilation will be effected by sun-burners, as the building is designed for the purpose of concerts or balls, and public meetings of all kinds, as well as a corn market. The old Assembly-rooms being contiguous, advantage has been taken to open out one of the apartments to form a gallery for an orchestra at the end of the hall.

CONDITION OF REIGATE.

SIR,—I cannot expect you to allow me to trespass upon your space, to the exclusion of matter probably more generally interesting to your readers than a discussion upon the state of the sanitary arrangements in Reigate. Still, as the statements of "Gargoyle" and myself have been called in question, I hope you will try to find room for these few lines.

I have no idea who "Gargoyle" is, but I have no doubt he is prepared to substantiate all that he has written. I know that I am prepared to do so.

There is the Blue Book of the Reigate Election Inquiry; there are the reports of the council meetings as reported in the *Surrey Standard*; and there is the place itself, which any one can inspect. What more is needed?

"R. J. W." states that some of my remarks are unfortunately true, but that I depart from the subject. Now it seems to me that there is a great connexion between the sanitary condition of any place and the authorities who have full power to improve it if they choose to do so.

I do not know the *Surrey Advertiser*, and therefore have not seen the "honourable mention" made of "Gargoyle's" and my statements, but "*il n'y a rien qui coute si peu qu'une contradiction:*" and if spiced with a little vituperation, it is especially acceptable to some people. It is, however, sheer nonsense to speak of our remarks as "unfounded" and "calumnious."

Permit me to offer a word of advice to the authorities, although it may have no better effect than what others have given them before. Reigate is nothing without its private residents. It has no particular trade or manufacture to support it, but is almost entirely indebted for its prosperity to those who make it their private abode. Now the chief attraction for such a class is the natural beauty of the place, which is undeniably great; but that can be purchased too dearly, as many have found to their cost, through the defective drainage and the stench arising from open privies, drains, and cesspools. Let, then, those who have the means in their hands use them speedily and vigorously to make the place as sweet and clean as it can be made, and clear the reputation which is at present under a cloud. But to do this the matter must not be left to subordinates. Each member of the Council should not rest satisfied without a personal inspection of all open privies, drains, slaughter-houses, &c., and should particularly not be afraid to enter a place for that purpose because it may happen to belong to a fellow member of the Council or a personal friend. By doing this the Council will earn the thanks and goodwill of the large majority of the population, besides rendering the place still more attractive to a class who come into a neighbourhood and are the great supporters of the schools, hospitals, and other charitable institutions in it.

I hope ere long I may have the pleasure of offering a tribute of praise as heartily as I have now uttered my measure of blame.

SALUS POPULI.

CONCRETE BUILDING.

SIR,—I presume Mr. H. Goodwin, in his note appearing in your issue of the 31st ult., refers in some degree to the notice announcing the licence of the Metropolitan Board to use my Patent Monolithic Fire-proof system.

If you will kindly find a place for the following remarks, they may perhaps throw some light on the matter. From what transpired in the course of my applications to the Board as to my patent, it appeared to me they were exercising due caution in their opposition to the use of concrete, on the ground that hitherto concrete walling in this country has been often executed in so unsatisfactory a manner as to be very unreliable, and to have frequently failed. The defects have been increased by the unskilful employment of courses of bricks or stones, variously termed "packing" and "bond courses,"—as though concrete, correctly appreciated and properly wrought, were not itself the finest bonding material in use.

In one word, concrete in England is so erroneously treated as to be generally a weak, spongy mass, in comparison with the powerfully adhesive and impermeable substance it becomes under correct manipulation.

I showed that it was in conformity with this correct treatment operations on my system were conducted.

To show the veritableness of the distinction I have pointed out, it will be enough to say that I have put up a flat roof on my system, chiefly of grey lime and ballast, and another part of Portland cement and ballast, but only 6 in. thick, and although exposed to the heavy rain of the last three months, it has never exhibited the slightest sign of leakage. On the contrary, I read the following passage in the description of a cement bridge in a scientific periodical:—

"Nevertheless, the porous nature of even such good concrete as that used in this bridge is shown by the fact of rain passing through it in the course of a few hours."

PHILIP BRANNON.

CONCRETE AND THE METROPOLITAN BOARD OF WORKS.

SIR,—As Mr. H. Goodwin is unable to understand the explicit resolutions passed by the Metropolitan Board of Works, relative to the erection of concrete buildings within the metropolitan area, I will endeavour, as far as I am able, to elucidate them for him.

It is quite true that I have been summoned twice, as also Tall & Co. (Limited), once, for this system of building, and in each case the complaint has been dismissed or withdrawn, but not before the works in progress (including the Peabody buildings), have been carefully watched and minutely examined.

The result of these careful investigations has, no doubt, convinced the practical gentlemen engaged, that the system of building in concrete, as carried out by Tall & Company (Limited), is applicable to the present rules of the Building Act.

Mr. Goodwin appears to understand that it is the Patent Building Apparatus that has influenced the decision. I am of an opinion that the Metropolitan Board of Works have been simply convinced by the superiority of the buildings erected by myself and Tall & Co. (Limited): it cannot possibly be supposed that this company would erect concrete buildings unless they were carried out in the best and most careful manner, knowing that a failure would be ruin to the company, who have not only a reputation to maintain, but a large capital at stake.

With the speculative builder, the question is very different: so long as he runs up his buildings quickly, and cheaply, obtaining advances as the work progresses, it is all he has to study. I am, however, in a position to prove that a builder cannot build cheaper between planks than with my patent apparatus.

Some works now being carried up at the present time, in London, between planks, are a disgrace to concrete; and I am also in a position to prove that the materials used in some cases are quite unfit for the walls, which are really dangerous.

As the last straw breaks the camel's back, so it is with concrete: *it will not bear excessive abuse.*

Your correspondent will justly see that it is this class of concrete building that requires a special license and supervision, which, doubtless, the Metropolitan Board of Works will take care to have properly attended to.

JOSEPH TALL.

NOMENCLATURE.

SIR,—In your report of Mr. Edmund Sharpe's excellent address after the Northamptonshire excursion dinner, a quotation is given from the address of the "President of the Northern Architectural Societies" on the Nomenclature of Gothic Architecture. Now I do not object to be quoted, even adversely, in such company as Sir Gilbert Scott and Mr. J. H. Parker. I simply write to state that the address referred to was delivered by me as president of the Liverpool Architectural Society, and not the "Northern Architectural Societies." HY. H. VALE.

PROPOSED RECREATION GROUND FOR WARRINGTON.

SIR,—Unless the Local Government Board at Whitehall steps in to interfere, the mayor and corporation of Warrington are about to do a very foolish thing. Under the pretentious whim of a Public Recreation Ground, they propose to purchase, at the cost of 1,000*l.* an acre, a space of ground in the centre of the borough, very valuable, it is true, for building ground, but, as its present owner states, in a condition of "perpetual eclipse" from the murky and corrosive atmosphere by which it is constantly enveloped. Moreover, this purchase and purpose are vehemently protested against by a large majority of the ratepayers; and, strongest point of all, by the four senior medical practitioners of Warrington, resident there respectively forty-seven, thirty-seven, thirty-six, and twenty-nine years. The folly would be less if the ground could be re-sold hereafter; but the purchase-money having to be borrowed from Government under the Recreation Grounds Act, this costly and objectionable site must remain for ever devoted to this, and to no other purpose. Even of the limited space above-named (12½ acres), only 5½ acres are to be allotted for the free and unrestricted use of the ratepayers, where they may indulge in a fair foot-race, or enjoy an honest game at football, golf, or leap-frog, the whole of the remainder being devoted to an ornamental garden (oh! such a garden), a cricket-ground, and a bowling-green, none of which can fairly be looked upon as a public recreation-ground.

As a still further addition to the cost, the deed of transfer of the land is to contain a clause binding the corporation to form a new street, of twenty yards wide, along one side of the recreation-ground, the cost of which is estimated at 2,400*l.*

From such a needless waste of the ratepayers' money, it is to hoped that the discretion vested in the Local Government Board may be powerful enough to deliver us.

M. D.

*** We insert this in deference to the medical men of the town, and with a view to inquiry as to the fitness in position of the land. We must not be regarded as offering the slightest opposition to the provision of a Recreation Ground for Warrington: a step we would by all means aid.

WEST HAM SEWAGE AND IRRIGATION.

SIR,—To your correspondent who assumes the name of "Sanitarian" in last week's *Builder* I have only to reply that the cost of land for irrigation when negotiated for by a public Board is a very different matter to its cost at a public auction. My Board were unable to obtain land by any other means than either private negotiation or the exercise of compulsory powers; our negotiations were carried on with one of the most respectable firms in the City (Messrs. Beadel), and my Board, looking to the financial results of the use of compulsory powers and abitration in other like cases, considered themselves fortunate in securing, without litigation, 750 acres of freehold land, near London, with approaches by road and rail, and a Thames frontage, at an average cost of 96*l.* per acre.

My communications to the *Builder* upon this subject had reference to the general question of irrigation; but as "Sanitarian" cannot rise above the local case and personal remarks, I must dismiss his letter without further comment.

LEWIS ANGELL.

MONUMENTAL.

AN Aberdeen polished granite cross, 12 ft. in height, has just been erected at Penderyn, in memory of the late Rev. C. Maybery, who had been rector of the parish for over forty years, and an active magistrate for the counties of Brecon and Glamorganshire during the greater part of that time. The red foliated cross stands upon a grey granite circular column with moulded cap and base, and this rests upon a square base of Forest of Dean stone, having small recessed red granite shafts at the corners, with sunk trefoils of similar material in the front of the four gablets projecting from the apex of the cap. The inscription slab is of black marble, and is let into an arched recess on one of the sides of the base. Mr. T. D. Williams, of Aberdare, was the sculptor employed by the architect, Mr. E. H. Lingen Barker, of Hereford.

THE DRAINAGE OF EVESHAM.

AT a special meeting of the town council the sanitary committee stated that Mr. J. F. Fairbank, C.E., had, at the request of the council, made an inspection of the town, and advised the adoption of the irrigation system of drainage; but this, on account of the enormous outlay (40,000*l.*), as well as the difficulty of obtaining land for the purpose, was impracticable. Mr. Barry, of Liverpool, advised the adoption of the "filtration process." On account of the wide difference between the cost of the estimates of these two gentlemen (the latter being about 4,000*l.*) the committee were compelled to exercise the greatest possible caution in the matter, and reported their inability to recommend the adoption of any particular system of drainage, without further advice, and proposed that the Local Government Board be requested to send down an inspector to suggest remedial measures.

ARCHÆOLOGICAL SOCIETIES.

The Cumberland and Westmoreland.—The members of this society have held a meeting in the western division of the district. They assembled at the Holborn-hill Railway Station, whence they proceeded to Millom Church and Castle, several of the ladies and gentlemen taking a circuitous route for the purpose of examining the "Gallows Stone." The party examined the interior of the castle, and Dr. Simpson, who was appointed chairman of the meeting, proposed a vote of thanks given to Mr. Knowles for a paper he read; after which some of the party took conveyances for Kirksancton and Lacra, and others proceeded to Lacra on foot. Lacra is an ancient cultivated estate on the summit of a hill, 500 ft. above the level of the sea. It is surrounded by a circular stone fence. The objects worthy of notice on Lacra are a kirk, or peil, called "Old Kirk,"—consisting of an irregular heap of ruins,—50 yards long by 25 yards in width,—two stone circles, three artificial platforms or terraces, an inclosure dyke, and an extensively furrowed surface. The party next proceeded to Silecroft Railway Station, where a paper on "The Ancient Remains of Lacra and Kirksancton" was read by Mr. Eccleston. He said that

"The south of Cumberland, until the close of the last century, seems to have been specially rich in that class of ancient remains, commonly called 'Drudical.' More than ordinary facilities were offered for the formation of these rude structures by the numerous fragments of rock that bestrowed the district. At the breaking up of the Eskdale and other West Cumberland glaciers, the plain at the foot of Black Combe, and for nearly 1,000 ft. up its sides, together with minor heights, were sprinked over with boulders of all sizes and from various quarters. South of the Esk ten different stone structures are recorded, namely, six stone circles, a giant's grave, a kirk,

a huge cairn, and a city—that of Barnscar. Of this catalogue the loss of nearly one half had to be deplored; three circles and the cairn have been wholly obliterated."

On reaching St. Bees, the party dined at the Royal Hotel. The meeting on Friday morning took place at St. Bees Church. An adjournment was then made to the lecture-hall of the college, where Mr. Jackson read a paper on the "Registers of St. Bees." The weather was exceedingly favourable. On reaching Egremont, or the "Mount of Sorrow," the party at once proceeded to the castle ruins. At Calder Bridge luncheon was provided at the Stanley Arms, and a visit was paid to Calder Abbey. The members and friends then drove through one of the most beautiful districts in Cumberland to Gosforth Church, where they were kindly received by the Rev. A. B. Cheese, the rector. Here the meeting closed.

The Cambrian.—As we have already noted, a series of five days' excursions has taken place in the neighbourhood of Brecon, under the auspices of this Association. The weather was happily favourable, and the programme of meetings and excursions was carried out, on the whole, very effectually, the appointed routine of the out-door proceedings being generally adhered to. On Monday evening, the 26th ult., the inaugural address was delivered in the Town-hall, Brecon, to a large and distinguished party of ladies and gentlemen,—members and friends,—by Sir J. R. Bailey, bart., M.P., the newly-elected president. Professor Babington, of Cambridge, was present. Papers were read at each of the three evening meetings upon various subjects. 1. "On Wales and its Saints in the Sixth and Seventh Centuries," by Mr. M. J. Rhodes, of Pennoyre. 2. "Some Remarks upon Prince Llewelyn," by Mr. W. Rees, of Tonn, Llandovery. 3. "The Battle of Mortimer's Cross," by Mr. F. Edmunds. "Llanthew Church, and the Ruins adjoining which mark the Site of the Palace of Geraldus Cambrensis," by the Rev. J. Lane Davies, vicar of Llanthew. 5. "Clifford Castle," by Mr. Wm. Rees, of Tonn, Llandovery. 6. "Porchester during the great Rebellion," by Mr. Rowland Phillips, barrister-at-law. Trips were taken daily into the surrounding district, and the chief churches, castles, venerable ruins of all descriptions, and Druidic remains, within the county of Brecon were visited by the party during the campaign.

Re SANITARY SCIENCE, &c.

SIR,—Your ably and sensibly written articles on the public health of our towns deserve to be much more generally known, not only in England but in America. For myself, I feel grieved to see this lovely river, flowing, as it does, through the most beautiful district of England (Maidstone), positively worse than any stagnant pool in Southern Africa.

I came down here last August, after an absence of forty-eight years; but quite unprepared to see almost on the first morning after arrival the whole atmosphere covered with smoke, worse than in the neighbourhood of the Lambeth potteries,—I mean the village of Tovil. Some person, probably a friend of Lord Romney, has erected oil-cake mills; and, through my window in bedroom, I am almost suffocated with smoke. No one seems to take any notice. As for the river, which used to be pure when I was a boy, I now cannot and do not go within 100 yards of it if I can help it. Do send some one to see this polluted river.

R. HODGSKIN.

A STEAM HAMMER FOR WOOLWICH.

PREPARATIONS are being made on the site selected for the new foundry of the Royal Gun Factories at Woolwich Arsenal, for the erection of a 30-ton Nasmyth steam hammer, the largest ever made. It will strike a blow equal to the weight of about 800 tons, and the bed for the anvil has therefore to be of great strength. A hole 45 ft. square and 20 ft. deep was first dug, and then piles of timber to the number of more than 100 were driven into the solid gravel more than 20 ft. below, the interstices being filled with concrete. On the foundation a block of iron 30 ft. broad and 11 in. thick, and weighing 160 tons, was laid, and upon this two layers of oak balks. Upon the timber was laid another iron plate, 10 in. thick and 27 ft. square, weighing 121 tons, and then followed more oak balks, standing vertically and bound together by wrought-iron bands. Two more iron plates, weighing 214 tons, have since been lowered upon the bed, and one heavier than any yet employed is to follow. Upon this will rest the anvil-block, which is shortly to be cast in the arsenal, and will weigh 102 tons, and upon this finally the anvil-face, which will be 12 ft. in diameter and weigh 60 tons. This will bring the anvil up to the level of the forge floor, and all the excavations round it will be rammed in with concrete into a solid mass. The erection of the factory walls has not yet commenced, but in several parts the timber-fields on which it will stand has been excavated and the underground work completed.

"DISINFECTING DWELLING-HOUSES."

SIR,—After stripping off the paper and exposing the bare wall, I have found Mudie's Disinfectant (in solution) to be the best deodoriser.

My men have never suffered bad effects from infection, and I am sure the above is preferable to carbolic acid, or even caustic soda.

HOUSE PAINTER.

SCHOOL DESKS.

SIR,—Mr. Wilson's letter of last week appears to me to indicate considerable misapprehension as to the meaning of Mr. Moss's desk. The problem is to arrange children for efficient teaching in such a manner that they shall be able either to sit or to stand comfortably, and yet that the desks shall not be moved about. Seeing that the space suitable for sitting is much less than that necessary for a standing position, Canon Cromwell has met the difficulty by the provision of a hinged flap to the desk, which, at a given word, is let down, and the boys then rise. Mr. Moss, on the other hand, devotes his exclusive attention to the convenience of the sitting position, and enables his children to stand by arranging them in groups of two only, so that, at a given word, they stand out laterally into the gangways, one behind the other. Both of these arrangements are highly ingenious, but that by Mr. Moss secures the absence of anything moveable and liable to create a noise in the school, while it gives great facility of access (and, therefore, of supervision) on the part of the teacher, and, above all, allows circulation of air by the gangways on one side, at least, of each child. As to actual space occupied by the two plans, there is little difference, but the proportion of the class-room becomes different.

"Convertibility" is the very thing which no one now wishes to see adopted. Hitherto (owing to the necessity of using schools for all kinds of purposes), the best shape and disposition of a school in reference to its educational use has been overlooked in favour of making the room available for school treats, Sunday school arrangements, &c. But School Boards will, no doubt, adopt those arrangements which are best calculated to promote efficient teaching. Only this week I have heard of a "convertible" desk crushing a child's finger.

Great George-street. E. R. ROBSON.

THE RESTORATION OF THE WEST FRONT OF WELLS CATHEDRAL.

THE first portion of the works,—the centre compartment, reported by Sir Gilbert Scott and Mr. Ferrey to be necessary, having been completed, and the second portion,—the south-western tower,—being on the eve of completion, a meeting of the general committee was held at Wells, when there were present the Lord Lieutenant the Earl of Cork, who presided, the bishop, the dean, and others, as also Mr. Ferrey, the architect. It appeared that the liabilities on the contract for the second portion of the work exceeded the amount of subscriptions available, and that further subscriptions were needed to meet these liabilities and to complete the third portion of the work,—the north-west tower,—not yet contracted for. It was decided to call a public meeting, to be held in the Chapter-house, on the 9th of October, to receive from the sub-committee a full report of the progress of the works, the work remaining to be executed, and the state of the funds, and to suspend in the interval the consideration of entering into a contract for the third portion of the work.

St. Pancras Surveyorship.—Mr. H. H. Bridgman has resigned the office of Assistant-Surveyor of St. Pancras, London.

CHURCH-BUILDING NEWS.

Wentworth (near Sheffield).—A new parish church is to be erected in this village, on a plot of ground very near to its predecessor, and on the opposite side of the existing carriage-road to Wentworth House. Mr. J. L. Pearson, of London, is the architect. The edifice will consist of a nave, two side aisles, north and south transepts, chancel, vestry, tower, and spire. The extreme length of the building, taking the outside measurement of the walls, but excluding the buttresses, will be 120 ft.; width across the nave, including the side aisles, 52 ft.; width across transepts, 68 ft.; length of chancel, including the chancel arch, 31½ ft.; width of chancel, 26 ft. The vestry will be on the north side of the chancel, and its dimensions will be 25 ft. by 14 ft. The total height of the tower and spire, including ironwork and vane at the summit, will be 180 ft., the tower itself being 87 ft. in height. Height of church from floor level to eaves of roof, 41½ ft.; and from floor to ridge of roof, 56 ft. The tower will stand in the centre of the transepts, or nearer to the east than the west end of the building. Entrance to the church will be gained by a porch on the north or village side, and it is intended that this shall be the sole means of ingress or egress for the parishioners. A small door on the same side will be used merely as a vestry entrance. Light will be imparted to the body of the church by four three-light windows in the clearstory of the nave. There will also be eight two-light windows in the south aisle, and seven windows of a similar description in the north aisle, the place of the eighth window being occupied by the porch. At the west end of the church will be a large six-light window, with tracery in the head. Each transept will be lighted by a large six-light window at the north and south ends, the heading of these also being filled in with tracery. The transepts will have side windows of four lights each. The chancel window will, of course, be the most elaborate. It will contain five lights, and the head will be enriched with tracery. Above the arch of this window, and in a gable, will be placed a circular window, with tracery of seven quatrefoils. The chancel will be further enlivened by two three-light windows on each side. The interior of the church will be stone-groined throughout with moulded and carved ribs and stone spandrels. There will be a triforium round the chancel, and also at the west end of the nave, access to which will be obtained by small turreted spiral staircases. The chancel will have an arcading on the north and south sides, each arcade being divided into four panels under the bays of the windows, the heads being traced. The mouldings generally about the arches and the groining will be ornamented with dog-tooth tracery pattern. The tower will spring from, and be supported by, four stone pillars at the junctions of the transepts with the nave and chancel, each pillar having a moulded capital. The roof of the space beneath the tower will be groined as the rest of the roof of the church, and as this ceiling will be considerably higher than the groining of the nave, it has been found necessary to introduce windows on the north and south sides. The ringing-loft will be above the groining, and above this will be the bell-chamber, which will be lighted by two windows on each side of the tower. The nave will be separated from the side aisles by an arcading of four arches on each side. The whole of the nave and aisle passages, with the chancel, except that portion east of the communion-rails, the vestry, the porch, and all other parts of the church, will be paved with Staffordshire tiles, red and black, with black tile borders. The space inside the altar-rails will be paved with a richer kind of tile. The seats will be all open, of American oak, with English oak backs and ends. There will be very little carving or ornamentation about them, but they will be moulded, both at the ends and backs. Provision will be made for the organ in the north transept, and here also will be the seats for the choir. Under the vestry will be constructed a chamber to contain the heating apparatus. The tower, battlemented at the top, will contain a clock facing to the north, the spire springing from the inside of the battlements. Instead of running in a direct line to the point of the angle, the spire will slightly swell outwards. Access to the tower will be gained from outside by a spiral staircase at the south-east angle, formed by the junction of the chancel with the south transept. The church

proper will be entirely built of Dunford Bridge rubble stone, laid in random courses. The internal face of the walls and all dressings will be of Darfield stone ashlar. The roof will be composed of Staffordshire tiles of a strawberry colour, except the roof of the chancel, which will be covered with lead. A large space of ground around the church will be enclosed by a stone wall, and laid out neatly, but not used at present for interments. A carriage-road will run directly from the east end of the tower to Wentworth House, for family use. For the convenience of the villagers a road is intended to be formed in a direct line from the church porch to the principal street of the village. Mr. J. W. Booth, of London, is the contractor. The clerk of the works is Mr. Joseph White, of London.

Dunkirk.—The parish church has been re-opened after restoration, alteration, and improvement. The edifice has been built only thirty-one years; but it appears that the foundations of the buttresses were found to be defective, and they have all been pulled down and rebuilt in cement. The old lead on the ridge of the roof has also been removed, and replaced with red ridge tiles. Internally, the organ and choir gallery at the west end have disappeared, and the organ is now placed in a new separate chamber, built out on the south side, forming a transept, with seats for thirty choristers. The chancel, which was quite plain, has been decorated by Messrs. Harland & Fisher, of London. The whole of the pews, which were previously stained, have been painted and varnished, and are now of a lighter colour to be more in harmony with the general character of the internal arrangements of the building. There is also a new lectern of oak on an illuminated pedestal, the gift of Mr. Henry Saddleton, of Whitstable. The restorations have been carried out by Messrs. Goode & Payn, under the supervision of Mr. Broadbridge, architect. The total cost of the works is estimated at 500*l.*

DISSENTING CHURCH-BUILDING NEWS.

Darlington.—A new Wesleyan chapel in North-road, Darlington, has been opened for public worship. The edifice will seat 1,500 persons. The site has been presented by Mr. W. Barningham. The cost of the structure amounts to 4,200*l.*, of which sum about 3,200*l.* have been already subscribed or promised. The design was prepared by Mr. Pritchett. The interior is comparatively plain, but commodious. The acoustic properties of the building, however, are good. The building is in the Romanesque style, and of red bricks, with stone dressings. The front towards the North-road has in the lower stage of the centre a double doorway, the space over the doorway being occupied by a large four-light window. This central part is finished by a gable, surmounted by a finial. The sides of the front are occupied by staircases, having steep-hipped roofs, to break the monotony usual in chapel fronts. In the lower story of each staircase is a single doorway, over which are two-light windows. All the doors and windows of the front have recessed jambs, containing pillars with moulded bases and carved caps. The sides of the building are designed with pilasters of brick and round-headed windows, in red and white bricks. The internal dimensions are 100 ft. long by 50 ft. high. The space is divided into nave and aisles by two tiers of iron pillars, the lower tier of which support roomy galleries, and from the caps of the upper tier spring moulded arches forming arcades from the top of which rises a wagon-headed roof, having moulded braces and purlins, and ceiled to the spars and collars. The first bay is occupied on the ground floor by a vestibule in the centre, over which the gallery extends, and by stone staircases at the angles, which, being inclosed all the way up, form abutments, from which the arcades spring. The last bay in the rear is occupied by a large vestry in the centre, over which is the choir, and at each side are three stories of vestries, and a staircase leading up to them. The whole of the seats are low, with slanting backs, and provide accommodation for about 1,500 persons. About 400 of the seats are free and open, all the rest having low doors. The pulpit is of pitch-pine, varnished, and all the rest of the woodwork is painted. The warming and winter ventilation are effected by Lewis's patent warm-air apparatus. In summer fresh cold air can be admitted through the same channel, and also by a number of Sheringham's ventilators near the ceiling, and the foul air is extracted by gas furnaces in the roof, connected with various ventilators by sheet-iron tubes. The lighting is by star-lights, dependent from the main and gallery ceilings. The site, which contains space for a minister's house, is surrounded on three sides by light low railings on dwarf walls, the back being inclosed by a plain brick wall. The works have been carried out by the following contractors:—Brick, mason's, and plasterer's work, Messrs. Hornsey; slating, Messrs. Atkinson; joiner's work, Mr. Armitage; painting, Mr. Wilson; ironfounder's work, Mr. Davison; plumbing, Mr. Lishman, all of Darlington; warming and ventilating, Mr. Lewis, Newcastle; gasfittings, Mr. Gilbody, Manchester; ornamental metal-work, Mr. Dovey, Manchester; carving, Messrs. Bustall & Taylor, Leeds.

Coniston.—The memorial-stone of a new chapel for the Primitive Methodists was laid last week at Coniston, about one mile from the village of Swine, in Holderness. The tender of Mr. Pickering, of Coniston, has been accepted, at 199*l.* The architect is Mr. Frank N. Pettingell, of Hull, who is also the architect for the new chapel now in course of erection in Williamson-street, Holderness-road.

Tettenhall Wood.—The memorial stone of a Congregational Chapel, intended to supersede the present inconveniently small and ill-adapted building in which the Congregationalists of Tettenhall Wood now worship, has been laid by Mr. S. S. Mander, in the presence of a large assemblage from Wolverhampton, Sedgley, Bilston, and other places round the district. The building will be 58 ft. long by 33 ft. broad, and will accommodate, including a north gallery, about 400 adults. The style is Geometric. The walling will be stone faced, the stone used being from the Codsall quarries. The north front will be a gable with central doorway, and a turret at the western angle, the turret to be 60 ft. high. The contract has been taken by Mr. Cockerill at 1,808*l.* The architect is Mr. Bidlake, of Wolverhampton.

ROMAN CATHOLIC CHURCH BUILDING NEWS.

Kensal New Town.—The new Roman Catholic schools and temporary church in Bosworth-road, Kensal New Town, were opened on Sunday, the 8th inst. The architect is Mr. S. J. Nicholl, and the contractor Mr. A. Stoner.

SCHOOL-BUILDING NEWS.

Addingham, near Ilkley.—The memorial-stone of a new Sunday and day school, about to be erected by the Wesleyan Methodists at Addingham, has been laid, in the presence of a large gathering of spectators. The building has been designed in the Gothic style of architecture, by Mr. Geo. Smith, of Bradford, and on a scale that will give accommodation for about 200 children. It is to consist of one large schoolroom, 50 ft. by 30 ft.; and two class-rooms, each 17 ft. by 14 ft. Land has also been acquired for a playground. The cost of the school and land will be about 1,000*l.*, but a further outlay of 250*l.* is contemplated in the erection of a teacher's residence. The contracts for the various works have been let to Mr. Geo. Smith, builder, Addingham; Messrs. J. & B. Emmott, joiners, Addingham; Mr. James Whitaker, plumber, Addingham; Mr. O. Lister, plasterer, Ilkley; and Mr. Samuel Thornton, slater, Bradley.

Great Wyrley.—New schools and master's residence have been commenced at Cheslyn Hay, Great Wyrley, Staffordshire. The site has been given by Lord Hatherton, and the cost of the buildings will be 800*l.* Mr. Greensill, of Great Wyrley, is the builder; and Mr. Griffin, of Wolverhampton, the architect.

STAINED GLASS.

Cadoxton Church, South Wales.—A stained-glass window, consisting of two lights and tracery, has been fixed in this church. The subjects are Abraham's sacrifice, Good Samaritan, and the Raising of Lazarus. Mr. S. Bourne was the artist.

Hunsingore Church, Wetherby.—A stained-glass window, by Messrs. Hardman, of Birmingham, has just been placed in this church. It is the gift of Mr. Wood, of Cattall, in memory of his grandparents. The window consists of three lights, representing St. John the Baptist preaching.

Hockerill Church, Bishop Stortford. — Six stained-glass windows, by O'Connor, of London, have lately been placed in the south aisle of this church. In the eastern window of the aisle, which is a memorial window, the subject is the Female Saints of the Old Testament, arranged in chronological order. In the western window the subject is the High Priests of the Jewish Dispensation, also in chronological order. In three of the southern windows are the twelve Minor Prophets, in the order in which their writings are placed in the Old Testament, four figures being placed in each window. In the smaller window are the figures of Ezra and Nehemiah. Two of the windows representing the Minor Prophets are memorial windows to the Rev. Arthur Henry Blunt, one of them having been given by the superintendent, governesses, and schoolmistresses of the college, together with all Mr. Blunt's former pupils during the eight years of his chaplaincy. The dedication of the church (All Saints) has been kept in view in arranging the subjects for the windows. In the west windows are four classes of Saints, Patriarchs, Prophets, Kings, and Martyrs. In the chancel, where the subjects are chosen entirely from the New Testament, are represented in the east window the twelve Apostles, and our Lord in Glory as the King of Saints; in the north window are three of the Saints and Evangelists mentioned in the Acts of the Apostles. One of the southern windows has for its subject the Female Saints of the New Testament. In the southern window are three Bishops, as another class or order of Saints—St. Timothy, St. Titus, and St. Clement.

Dunfermline Abbey.—A stained-glass window has been erected in the nave of this abbey to the memory of the late Mr. and Mrs. Hunt, of Pittencrieff. The window is situated at the north-west angle formed by the walls of the western tower, and is at once seen on entering from the north porch. Stone mullions divide it into three tall pointed lights, with three tracery openings above. The three upright compartments contain illustrations of incidents connected with the death, burial, and resurrection of our Lord. In the first group is seen St. John leading home Mary, the mother of Christ. In the centre light is represented Jesus being laid in the sepulchre by St. John and Nicodemus, Mary Magdalene, and other women. In the third compartment, and forming a completion to the series of subjects, is the scene of our Lord appearing to the women after his resurrection. In panels underneath these groups are angels seated upon enshrined thrones, and bearing scrolls inscribed "I am the resurrection and the life. He that believeth in me, though he were dead, yet shall he live." Over the subjects are foliated canopies of early character, terminating in crosses of mosaic colouring. In the leading points of the tracery are starry crowns, and the emblem of the Trinity. The glass is entirely composed of thick crystalline colours. The whole has been designed and executed by Messrs. Ballantyne, of Edinburgh.

FROM SCOTLAND.

Edinburgh.— After many years of delay, Trinity College Church is now fast approaching completion, and can be well seen from the Calton Hill, Regent's Arch, or North Bridge. The apse of the original church is being carried up at the same time in the shape of an *annexe* behind the modern church. It is now so far advanced as to be ready for throwing over the stone arches of the roof, so that in a short time the old groined ceiling, with its carved bosses, will again be in proper position after lying so long on the Calton Hill.——A public meeting has been held in the Freemasons' Hall, Blackfriars-street, says the *Weekly Scotsman*, for the purpose of memorialising the Town Council against the re-erection of the piazza at the corner of Blackfriars-street. The Rev. Mr. Gillespie, who was called to the chair, remarked that the piazza was not only unseemly in appearance, but dwarfed the other new buildings in the street, and hoped that it would not, after being taken down, be put up again. The meeting formally agreed to memorialise the Town Council, with the view of having the piazza removed altogether. A committee was thereafter appointed to draw up the memorial, and present it to the Town Council.

Blairdrummond.—The large east window in Kincardine Church has just been filled with stained glass in memory of the late Mr. and Mrs. Home-Drummond, of Blairdrummond. The

window is divided into four upright compartments, with top tracery. The church is in the Perpendicular style of architecture, and the details of the glass are all in accordance with the structure. The subjects illustrated are "Jesus weeping at the Grave of Lazarus," "Christ's Agony in the Garden," "Christ bearing His Cross," and the "Angel at the Sepulchre announcing to the Marys 'He is risen.'" The subjects, we believe, were selected by Mrs. Drummond. In the central shape in the top tracery is a group of angels worshipping. Over the illustrations are canopies, and the remainder of the lights are covered with rich borderings and foliated grizaille ground-work. The window has been executed by Messrs. Ballantine, of Edinburgh. We understand that, in addition to the window just erected, the Messrs. Ballantine have been commissioned to put in other three stained-glass windows by parties who have a connexion with the parish of Kincardine.

VARIORUM.

"JENKINSON'S Practical Guide to the English Lake District" (Stanford, Charing-cross), is apparently the work of one who well knows the district, and will be found very useful by tourists. Its weak point is the want of proper architectural descriptions of remaining structures. The book includes a number of useful maps, clearly printed. —— "When Mother Died" (Kitto, Bishopsgate-street), is the title of a little tale for children, by Marie B——. It is a very touching story, charmingly written: a little over-sad for children. We advise the writer to take a more lively theme for her next.——"The City Sanitary Organisation: its Aids and Obstacles. By Kenneth M. Macleod. Glasgow: Adshead, Printer. 1872." This is a reprint from the *Poor-law Magazine* for Scotland, of a paper read before the Social and Sanitary section of the Glasgow Philosophical Society. Mr. Macleod is the Sanitary Inspector of the city of Glasgow. His purpose is rather to point out the duties of the various officers, the provisions and defects of the law, and obstacles to be encountered in carrying out the Public Health Act of 1867, and Police Act of 1866, than to treat of the sanitary state of the city, either before or since these Acts were passed.——In the new number of the *Leisure Hour*, Mr. Timbs, continuing his Personal Recollections, gives appreciative and interesting notes of some who were contributors to works with which he was early connected;—Dr. Charles Mackay, W. A. Chatto, "Alfred Crowquill," Peter Cunningham, Mr. Henry Cole, C.B., and several others.

Miscellanea.

The Copenhagen Exhibition. — This "Northern Exhibition of Industry and Art" is now open. In the fine arts, Norway is especially represented by landscape. Adolph Tidemann occupies a prominent place. Professor Hans Gude, of Carlsruhe, has furnished many works of high standard quality, the best being "Morning in a Norwegian Harbour." Ludwig Munthe, of Düsseldorf, has supplied a winter landscape in twilight. Among historical paintings especially notable are "Valkyrja" and "The Nightly Ride of the Rulers of Man's Fate," by P. N. Arbo, of Paris. The former idealises the mysterious being called Valkyrja, a female whom Odin sent to choose from the fallen host such as had won the bliss of Val-hall by a brave fight and a dauntless death. She rode over air and water, surrounded by a ghastly gleam, the so-called corpse-lustre; and, whereso-ever she was seen, was the harbinger of slaughter. This weird idea Mr. Arbo has endeavoured to embody in a handsome figure with a passionate blue-greyish eye, riding flutteringly on a loose and exceedingly wild black steed. Of the various departments in this Exhibition, there is none which commands such an amount of purely national interest as the department of domestic industry. In conception and design, this department is in some respects peculiarly original. The native industry of Norway bears such an intensely national stamp that nothing in the world could be mistaken for it. What is exhibited in the same class from Denmark bears an entirely different impress, and is so void of any specially-marked nationality that it might just as well be German.

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A Steam Paving Tool.—An apparatus of this kind has lately been tried in Paris, namely, a Steam Rammer. As used from time immemorial, the rammer is a heavy iron-shod implement which the workman raises about 1 ft. from the ground and allows to drop, as rapidly as he may, successively upon the boulders or blocks to be set. The object of the invention of M. Lignier is to save the labourer the severe physical exertion of raising the heavy tool, an exertion producing in time an injurious effect upon the lungs. In the apparatus of M. Lignier the heavy weight is lifted by a small Lenoir gas engine. To the fly-wheel of the engine is connected the rammer of steel, smaller but heavier than the ordinary instrument. The movement of the machine is controlled by the operator; and the rapidity of the operation, according to the inventor, more than counterbalances the greater first cost.

Stowmarket Church. — The quantity of stones that have fallen from the tower of this church during the last few days has been something alarming, and many fears are expressed by those who reside in the neighbourhood that the entire tower will shortly come down. Something ought to be done directly in the matter.

proper will be entirely built of Dunford Bridge rubble stone, laid in random courses. The internal face of the walls and all dressings will be of Darfield stone ashlar. The roof will be composed of Staffordshire tiles of a strawberry colour, except the roof of the chancel, which will be covered with lead. A large space of ground around the church will be enclosed by a stone wall, and laid out neatly, but not used at present for interments. A carriage-road will run directly from the east end of the tower to Wentworth House, for family use. For the convenience of the villagers a road is intended to be formed in a direct line from the church porch to the principal street of the village. Mr. J. W. Booth, of London, is the contractor. The clerk of the works is Mr. Joseph White, of London.

Dunkirk.—The parish church has been reopened after restoration, alteration, and improvement. The edifice has been built only thirty-one years; but it appears that the foundations of the buttresses were found to be defective, and they have all been pulled down and rebuilt in cement. The old lead on the ridge of the roof has also been removed, and replaced with red ridge tiles. Internally, the organ and choir gallery at the west end have disappeared, and the organ is now placed in a new separate chamber, built out on the south side, forming a transept, with seats for thirty choristers. The chancel, which was quite plain, has been decorated by Messrs. Harland & Fisher, of London. The whole of the pews, which were previously stained, have been painted and varnished, and are now of a lighter colour to be more in harmony with the general character of the internal arrangements of the building. There is also a new lectern of oak on an illuminated pedestal, the gift of Mr. Henry Saddleton, of Whitstable. The restorations have been carried out by Messrs. Goode & Payn, under the supervision of Mr. Broadbridge, architect. The total cost of the works is estimated at 500*l.*

DISSENTING CHURCH-BUILDING NEWS.

Darlington.—A new Wesleyan chapel in North-road, Darlington, has been opened for public worship. The edifice will seat 1,500 persons. The site has been presented by Mr. W. Barningham. The cost of the structure amounts to 4,200*l.*, of which sum about 3,200*l.* have been already subscribed or promised. The design was prepared by Mr. Pritchett. The interior is comparatively plain, but commodious. The acoustic properties of the building, however, are good. The building is in the Romanesque style, and of red bricks, with stone dressings. The front towards the North-road has in the lower stage of the centre a double doorway, the space over the doorway being occupied by a large four-light window. This central part is finished by a gable, surmounted by a finial. The sides of the front are occupied by staircases, having steep-hipped roofs, to break the monotony usual in chapel fronts. In the lower story of each staircase is a single doorway, over which are two-light windows. All the doors and windows of the front have recessed jambs, containing pillars with moulded bases and carved caps. The sides of the building are designed with pilasters of brick and round-headed windows, in red and white bricks. The internal dimensions are 100 ft. long by 50 ft. high. The space is divided into nave and aisles by two tiers of iron pillars, the lower tier of which support roomy galleries, and from the caps of the upper tier spring moulded arches forming arcades from the top of which rises a wagon-headed roof, having moulded braces and purlins, and ceiled to the spars and collars. The first bay is occupied on the ground floor by a vestibule in the centre, over which the gallery extends, and by stone staircases at the angles, which, being inclosed all the way up, form abutments, from which the arcades spring. The last bay in the rear is occupied by a large vestry in the centre, over which is the choir, and at each side are three stories of vestries, and a staircase leading up to them. The whole of the seats are low, with slanting backs, and provide accommodation for about 1,500 persons. About 400 of the seats are free and open, all the rest having low doors. The pulpit is of pitch-pine, varnished, and all the rest of the woodwork is painted. The warming and winter ventilation are effected by Lewis's patent warm-air apparatus. In summer fresh cold air can be admitted through the same channel, and also by a number of Sheringham's ventilators near the ceiling, and the foul air is extracted by gas furnaces in the roof, connected with various ventilators by sheet-iron tubes. The lighting is by star-lights, dependent from the main and gallery ceilings. The site, which contains space for a minister's house, is surrounded on three sides by light low railings on dwarf walls, the back being inclosed by a plain brick wall. The works have been carried out by the following contractors:—Brick, mason's, and plasterer's work, Messrs. Hornsey; slating, Messrs. Atkinson; joiner's work, Mr. Armitage; painting, Mr. Wilson; ironfounder's work, Mr. Davison; plumbing, Mr. Lishman, all of Darlington; warming and ventilating, Mr. Lewis, Newcastle; gasfittings, Mr. Gilbody, Manchester; ornamental metal-work, Mr. Dovey, Manchester; carving, Messrs. Bustall & Taylor, Leeds.

Coniston.—The memorial-stone of a new chapel for the Primitive Methodists was laid last week at Coniston, about one mile from the village of Swine, in Holderness. The tender of Mr. Pickering, of Coniston, has been accepted, at 199*l.* The architect is Mr. Frank N. Pettingell, of Hull, who is also the architect for the new chapel now in course of erection in Williamson-street, Holderness-road.

Tettenhall Wood.—The memorial stone of a Congregational Chapel, intended to supersede the present inconveniently small and ill-adapted building in which the Congregationalists of Tettenhall Wood now worship, has been laid by Mr. S. S. Mander, in the presence of a large assemblage from Wolverhampton, Sedgley, Bilston, and other places round the district. The building will be 58 ft. long by 33 ft. broad, and will accommodate, including a north gallery, about 400 adults. The style is Geometric. The walling will be stone faced, the stone used being from the Codsall quarries. The north front will be a gable with central doorway, and a turret at the western angle, the turret to be 60 ft. high. The contract has been taken by Mr. Cockerill at 1,808*l.* The architect is Mr. Bidlake, of Wolverhampton.

ROMAN CATHOLIC CHURCH BUILDING NEWS.

Kensal New Town.—The new Roman Catholic schools and temporary church in Bosworth-road, Kensal New Town, were opened on Sunday, the 8th inst. The architect is Mr. S. J. Nicholl, and the contractor Mr. A. Stoner.

SCHOOL-BUILDING NEWS.

Addingham, near Ilkley.—The memorial-stone of a new Sunday and day school, about to be erected by the Wesleyan Methodists at Addingham, has been laid, in the presence of a large gathering of spectators. The building has been designed in the Gothic style of architecture, by Mr. Geo. Smith, of Bradford, and on a scale that will give accommodation for about 200 children. It is to consist of one large schoolroom, 50 ft. by 30 ft.; and two class-rooms, each 17 ft. by 14 ft. Land has also been acquired for a playground. The cost of the school and land will be about 1,000*l.*, but a further outlay of 250*l.* is contemplated in the erection of a teacher's residence. The contracts for the various works have been let to Mr. Geo. Smith, builder, Addingham; Messrs. J. & B. Emmott, joiners, Addingham; Mr. James Whitaker, plumber, Addingham; Mr. O. Lister, plasterer, Ilkley; and Mr. Samuel Thornton, slater, Bradley.

Great Wyrley.—New schools and master's residence have been commenced at Cheslyn Hay, Great Wyrley, Staffordshire. The site has been given by Lord Hatherton, and the cost of the buildings will be 800*l.* Mr. Greensill, of Great Wyrley, is the builder; and Mr. Griffin, of Wolverhampton, the architect.

STAINED GLASS.

Cadoxton Church, South Wales.—A stained-glass window, consisting of two lights and tracery, has been fixed in this church. The subjects are Abraham's sacrifice, Good Samaritan, and the Raising of Lazarus. Mr. S. Bourne was the artist.

Hunsingore Church, Wetherby.—A stained-glass window, by Messrs. Hardman, of Birmingham, has just been placed in this church. It is the gift of Mr. Wood, of Cattall, in memory of his grandparents. The window consists of three lights, representing St. John the Baptist preaching.

Hockerill Church, Bishop Stortford. — Six stained-glass windows, by O'Connor, of London, have lately been placed in the south aisle of this church. In the eastern window of the aisle, which is a memorial window, the subject is the Female Saints of the Old Testament, arranged in chronological order. In the western window the subject is the High Priests of the Jewish Dispensation, also in chronological order. In three of the southern windows are the twelve Minor Prophets, in the order in which their writings are placed in the Old Testament, four figures being placed in each window. In the smaller window are the figures of Ezra and Nehemiah. Two of the windows representing the Minor Prophets are memorial windows to the Rev. Arthur Henry Blunt, one of them having been given by the superintendent, governesses, and schoolmistresses of the college, together with all Mr. Blunt's former pupils during the eight years of his chaplaincy. The dedication of the church (All Saints) has been kept in view in arranging the subjects for the windows. In the west windows are four classes of Saints, Patriarchs, Prophets, Kings, and Martyrs. In the chancel, where the subjects are chosen entirely from the New Testament, are represented in the east window the twelve Apostles, and our Lord in Glory as the King of Saints; in the north window are three of the Saints and Evangelists mentioned in the Acts of the Apostles. One of the southern windows has for its subject the Female Saints of the New Testament. In the southern window are three Bishops, as another class or order of Saints—St. Timothy, St. Titus, and St. Clement.

Dunfermline Abbey.—A stained-glass window has been erected in the nave of this abbey to the memory of the late Mr. and Mrs. Hunt, of Pittencrieff. The window is situated at the north-west angle formed by the walls of the western tower, and is at once seen on entering from the north porch. Stone mullions divide it into three tall pointed lights, with three tracery openings above. The three upright compartments contain illustrations of incidents connected with the death, burial, and resurrection of our Lord. In the first group is seen St. John leading home Mary, the mother of Christ. In the centre light is represented Jesus being laid in the sepulchre by St. John and Nicodemus, Mary Magdalene, and other women. In the third compartment, and forming a completion to the series of subjects, is the scene of our Lord appearing to the women after his resurrection. In panels underneath these groups are angels seated upon enshrined thrones, and bearing scrolls inscribed "I am the resurrection and the life. He that believeth in me, though he were dead, yet shall he live." Over the subjects are foliated canopies of early character, terminating in crosses of mosaic colouring. In the leading points of the tracery are starry crowns, and the emblem of the Trinity. The glass is entirely composed of thick crystalline colours. The whole has been designed and executed by Messrs. Ballantyne, of Edinburgh.

FROM SCOTLAND.

Edinburgh.— After many years of delay, Trinity College Church is now fast approaching completion, and can be well seen from the Calton Hill, Regent's Arch, or North Bridge. The apse of the original church is being carried up at the same time in the shape of an *annexe* behind the modern church. It is now so far advanced as to be ready for throwing over the stone arches of the roof, so that in a short time the old groined ceiling, with its carved bosses, will again be in proper position after lying so long on the Calton Hill.——A public meeting has been held in the Freemasons' Hall, Blackfriars-street, says the *Weekly Scotsman*, for the purpose of memorialising the Town Council against the re-erection of the piazza at the corner of Blackfriars-street. The Rev. Mr. Gillespie, who was called to the chair, remarked that the piazza was not only unseemly in appearance, but dwarfed the other new buildings in the street, and hoped that it would not, after being taken down, be put up again. The meeting formally agreed to memorialise the Town Council, with the view of having the piazza removed altogether. A committee was thereafter appointed to draw up the memorial, and present it to the Town Council.

Blairdrummond.—The large east window in Kincardine Church has just been filled with stained glass in memory of the late Mr. and Mrs. Home-Drummond, of Blairdrummond. The

window is divided into four upright compartments, with top tracery. The church is in the Perpendicular style of architecture, and the details of the glass are all in accordance with the structure. The subjects illustrated are "Jesus weeping at the Grave of Lazarus," "Christ's Agony in the Garden," "Christ bearing His Cross," and the "Angel at the Sepulchre announcing to the Marys 'He is risen.'" The subjects, we believe, were selected by Mrs. Drummond. In the central shape in the top tracery is a group of angels worshipping. Over the illustrations are canopies, and the remainder of the lights are covered with rich borderings and foliated grizaille groundwork. The window has been executed by Messrs. Ballantine, of Edinburgh. We understand that, in addition to the window just erected, the Messrs. Ballantine have been commissioned to put in other three stained-glass windows by parties who have a connexion with the parish of Kincardine.

VARIORUM.

"JENKINSON'S Practical Guide to the English Lake District" (Stanford, Charing-cross), is apparently the work of one who well knows the district, and will be found very useful by tourists. Its weak point is the want of proper architectural descriptions of remaining structures. The book includes a number of useful maps, clearly printed. —— "When Mother Died" (Kitto, Bishopsgate-street), is the title of a little tale for children, by Marie B——. It is a very touching story, charmingly written: a little over-sad for children. We advise the writer to take a more lively theme for her next.——"The City Sanitary Organisation: its Aids and Obstacles. By Kenneth M. Macleod. Glasgow: Adshead, Printer. 1872." This is a reprint from the *Poor-law Magazine* for Scotland, of a paper read before the Social and Sanitary section of the Glasgow Philosophical Society. Mr. Macleod is the Sanitary Inspector of the city of Glasgow. His purpose is rather to point out the duties of the various officers, the provisions and defects of the law, and obstacles to be encountered in carrying out the Public Health Act of 1867, and Police Act of 1866, than to treat of the sanitary state of the city, either before or since these Acts were passed.——In the new number of the *Leisure Hour*, Mr. Timbs, continuing his Personal Recollections, gives appreciative and interesting notes of some who were contributors to works with which he was early connected;—Dr. Charles Mackay, W. A. Chatto, "Alfred Crowquill," Peter Cunningham, Mr. Henry Cole, C.B., and several others.

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Fatal Accident in a Well.—Dr. Diplock has held an inquest at the Lamb, Chiswick, upon the body of Richard Swansborough, who was killed while boring a well at Messrs. Sich's brewery. The deceased and another were engaged in digging out the earth at the bottom of the well, which is 5 ft. in diameter and 132 ft. deep—the stuff so loosened being thrown into buckets and drawn to the mouth of a well by a windlass worked by two men, who were superintended by a third. Deceased and his companion had been but a few minutes in the well, and had only sent up two buckets of earth, the latter of which the superintendent was horrified to see was swinging by its bale or handle upon the very point of the hook. He had barely time to call attention to the precarious position of the bucket, and none to remove it, before it fell the whole depth of the well, striking the unfortunate Swansborough, breaking almost every bone in his body, and killing him instantly. Verdict — Accidental death.

A New Industry in Glasgow.—A few months ago, a gentleman, named Colonel Fish, came over to this country from America, with the object of developing a patent he had just taken out, for the manufacture of asbestos, or, rather, for the application of that mineral to steam-packing purposes. He took steps, in Glasgow, for the formation of a company to work his patent. That company was soon formed, and works for the new manufacture were erected in St. James's-street. Colonel Fish has lately been carrying out a series of experiments at Glasgow, with the view of testing the adaptability of asbestos for the manufacture of cloth and paper. The demand for the steam-packing patented by Colonel Fish has increased so much that it is in contemplation to build other and more extensive works in Glasgow, capable of turning out from 200 to 300 tons per annum. Practical engineers are of opinion that many more useful applications are likely to be found for this mineral.

A Steam Paving Tool.—An apparatus of this kind has lately been tried in Paris, namely, a Steam Rammer. As used from time immemorial, the rammer is a heavy iron-shod implement which the workman raises about 1 ft. from the ground and allows to drop, as rapidly as he may, successively upon the boulders or blocks to be set. The object of the invention of M. Lignier is to save the labourer the severe physical exertion of raising the heavy tool, an exertion producing in time an injurious effect upon the lungs. In the apparatus of M. Lignier the heavy weight is lifted by a small Lenoir gas engine. To the fly-wheel of the engine is connected the rammer of steel, smaller but heavier than the ordinary instrument. The movement of the machine is controlled by the operator; and the rapidity of the operation, according to the inventor, more than counterbalances the greater first cost.

Stowmarket Church. — The quantity of stones that have fallen from the tower of this church during the last few days has been something alarming, and many fears are expressed by those who reside in the neighbourhood that the entire tower will shortly come down. Something ought to be done directly in the matter.

Sanitary Report on St. Mary's, Islington. The annual report on the sanitary condition of the parish of St. Mary, Islington, during the year 1871, by William H. Corfield, M.D., Medical Officer of Health, has been printed by order of the vestry. In speaking of the sanitary work of the year, this report states that during the hottest part of the summer carbolic acid was used with the watering every Saturday in some of the closest streets; and once a week also McDougall's powder was freely thrown about many of the courts, yards, and dust-bins of smaller houses. The reporter thinks that "the whole system of dusting may, before long, have to be re-considered, as it is a growing opinion that it would be a wise sanitary measure to abolish entirely all dust-bins, and substitute portable receptacles in their stead; the metropolitan vestries making provision for the daily removal of refuse from each house."

St. Margaret's Church, Ipswich.—During the progress of the restoration of this church, the workmen discovered the remains of a mural painting in the spandrel between the second and third arches reckoning from the west end on the south side of the nave arcade. The picture seems to be an attempt to combine the legends of St. Christopher and St. Anthony praying with the fishes. At the bottom is the kneeling figure of a man in the act of prayer. Just above him are fishes of various kinds, the pike in the act of swallowing a smaller fish, the eel, the plaice, &c., and the water is visible, in spite of the mutilation which the picture has suffered. Above the highest of the fishes, in the widest part of the spandrel, are traces of the figure of a man. The figure appears to be wading through the water.

The Employment of Children in Brickyards.—At the Birmingham Police Court, Mr. John Bond, brick manufacturer, Garrison-lane, was summoned by Mr. W. H. Johnson, sub-inspector of factories, charging him with having employed in his brickyard four children, each under the age of thirteen years, for more than six hours and a half per day, and also with having employed a girl, under the age of sixteen years, contrary to the Workshops Regulation Act. Mr. Johnson said that not any of the children attended school, for which their parents were responsible. He would not press for a heavy fine, as he thought that the defendant would be careful not to infringe the law again. The magistrate imposed the mitigated penalty of 1s. and costs in each of the five cases, amounting altogether to 3*l.* 7s. 6d. The full penalty in each case is 3*l.*

Cambridge.—The guardians of the Cambridge Union are about to erect an infectious disease hospital on an isolated spot on the borders of the town, to consist of, on the ground-floor, for each sex, night and day convalescence wards, kitchen, and nurses' rooms, with offices. On the first floor will be two wards, each containing six beds, 20 ft. by 30 ft., and an occasional ward for two beds. All the wards will be ventilated by foul-air flues, worked in the walls, and a continual supply of fresh air will be admitted into the wards by small inlets, formed with iron hoppers, covered with fly-wire, at the top of the sashes. A detached dead and wash house will be provided. The works are to be carried out from the drawings and specification prepared by Mr. Edwin Bays, architect, Cambridge.

Sculpture, Birlingham Church.—We recently mentioned the completion of the works here. We may add to what we said, that the interior includes some carved small figures, &c., executed by Mr. Purdy, of London. On the north side of the church, at the entrance to the chancel, is a carved angel, on a stand. The angel is represented as holding an open Bible, and is intended for the pulpit. On the opposite side is the lectern, representing an eagle on a rock. Both of these are the work of Mr. Phyffers, sculptor, London, the material used being Corsham stone.

The New Lambeth Workhouse.—It appears from the proceedings which took place at the usual meeting of the Lambeth guardians last week, that the works of the new workhouse have so far progressed that it is now necessary to take measures for providing the fixtures and fittings, and the architect has submitted a set of drawings and specification for the same which, after some revision by the guardians, have been approved of, and tenders for the execution of the works ordered to be invited.

Proposed Children's Playgrounds for Salford.—At a meeting of the Salford Town Council, Councillor Mather moved,—"That it is desirable that three plots of land, respectively situated in Deal-street, Silk-street, and Springfield-lane, be acquired, either at a yearly rental or by purchase, for the purpose of converting them into playgrounds for the children of the poor inhabitants of the respective districts, and that the General Health Committee be authorised to consider the subject and report thereon." After some discussion, however, an amendment that the question of the formation of playgrounds for the children of the poorer inhabitants of the borough should be referred to the General Health Committee to consider and report to the Council, was adopted by a majority of twenty to six.

The Proposed New Dock at Maryport.—A crowded meeting of the ratepayers and shipowners of Maryport has been held for the purpose of having laid before them by the trustees a statement relative to the proposed new dock and works, and the probable cost of completing the same, and to take their opinion as to whether the trustees should proceed with the works. After some discussion, during which it was stated that the dock would cost 120,000*l.*, while the borrowing powers were only to the extent of 88,000*l.*, the chairman took the sense of the meeting as to whether the dock scheme should be proceeded with or abandoned, and it was decided by a large majority that the scheme should be abandoned.

Coate Reservoir, Swindon.—The culvert which conveys the water of a spring underneath Coate reservoir burst, and the water was rushing out when Mr. Fox, the lessee, ran to the hatch and let it down, then to the other end of the reservoir, and arrived in time to see the repulsed water flow out into the meadow there, but by letting down the other hatch he stopped this also. The spot where the leak had occurred was indicated by a whirlpool, and the confined air in the culvert suddenly blew the water up above the surface of the reservoir, like the spout of a whale. It appeared to be a serious leak, caused probably by the brickwork of the culvert settling down, the foundation being upon a kind of bog or quicksand.

Howel Harris's Memorial Chapel, Brecon.—The site selected for this memorial is a piece of ground near the old College at Trevecca, on the north-east side, and in the immediate vicinity of the birthplace of the reformer, and the spot where he lived and died. The ceremony of laying the stone has taken place. A platform had been erected for the purpose of holding a meeting on the spot where the foundation of the chapel lies. The Rev. Edward Matthews, of Cardiff, presided. The chairman delivered an address in Welsh, and, on behalf of the committee, handed Mr. Davies a silver trowel and mallet. Mr. Davies, who is a ready subscriber to worthy objects in the Principality, took off his coat, called for a sledge-hammer, and performed his task in a workmanlike manner.

Covered Sheds or Ventilating Barns.—These buildings save trouble in the field (by the crop being carted earlier than if it were to be placed in the old-fashioned closed barn): they allow corn to dry better than if packed in a stack, and especially they save cost of thatch and thatching. The cost of some such buildings is, it appears, from 8d. to 1s., according to material used, for each cubic yard of contents. Thus, says a correspondent of the *Bedford Times*, if 30 cubic yards were taken as the bulk from one acre, a shed to accommodate the produce of 100 acres would cost between 100*l.* and 150*l.* A solid erection of brick pillars, 14 ft. high, and as many feet apart, with a slate roof double that span, and a floor of concrete, would now be not far short of the latter figure.

Bristol City Surveyorship. — The joint committee of the town council to which this question was referred, have decided to recommend the appointment of Mr. Josiah Thomas, as city surveyor, at a salary of 700*l.*, with an allowance of 50*l.* in addition, for hire of horse and trap. Mr. Thomas will be permitted to retain his private practice, but must not undertake any work in which the interests of the parties concerned are antagonistic to the corporation. The staff required by Mr. Thomas will be appointed by the corporation, and not by that gentleman himself, as originally proposed.

Fall of a Party-wall in the New Cut.—An accident, which, had it occurred at any other part of the day than that during which it happened, would in all probability have been attended with loss of life, took place on Thursday last week, in the New Cut, London. About one o'clock in the morning, the inhabitants residing in the neighbourhood were disturbed by a rumbling noise, and upon getting up to ascertain the cause, they found that the party-wall inside the premises of Mr. Priest, who keeps a coffee and dining room on the ground floor only, had fallen down, driving the shop-front into the street, and destroying all the crockery and other materials in the interior, a considerable portion of the roof immediately over the shop falling in among the *débris*.

The Fountain Movement in Paris.—Three new fountains, provided for by the liberality of Sir Richard Wallace, have been opened at the Barrières de la Glacière, Montparnasse, and d'Enfer.

Edinburgh Cathedral Competition.—We understand that the designs have been referred by the trustees to **Mr. Ewan Christian**, with a view to his reporting on them.

TENDERS

New lecture-room adjoining Red-hill Congregational Chapel. Mr. W. F. Poulton, architect:—

Russell	£397 0 0
Bagaley	329 0 0
Cook (accepted)	325 0 0

For alterations and additions to Belle-vue House, Twickenham. Mr. W. G. Wallis, architect:—

Fish	£2,095 0 0
Higgs	1,987 0 0
Messum	1,972 0 0
Axeford & Wheeler	1,914 0 0
Hiscock	1,775 0 0
Langham	1,750 0 0
Knight	1,665 0 0
Lisle	1,630 0 0
Hurst	1,590 0 0

For vicarage-house, Comberton, Cambridgeshire. Mr. E. Bays, architect:—

Warboys	£1,428 0 0

For the erection of a new Wesleyan chapel, &c., at Bletchingly, Red-hill:—

Worsfold	£1,657 9 0
Taylor & Son	1,570 0 0
Peskett & Taylor	1,450 0 0
Reynolds & Eldridge	1,380 0 0
Brown	1,325 0 0
Wilcocks	1,293 0 0
Hickinbottom (accepted)	1,274 0 0

For a house at Sheen, for the Hon. S. R. Curzon. Mr. J. Peacock, architect:—

Lathey Brothers	£2,927 0 0
Simpson	2,900 0 0
Manley & Rogers	2,797 0 0
Adamson & Sons	2,775 0 0
Sweet	2,743 0 0
Sims	2,690 0 0

For buildings in the rear of No. 93, Fore-street, City, for Mr. Mein. Mr. J. Harrison, architect. Quantities supplied by Mr. A. W. Q. Nicoll:—

Henshaw	£558 0 0
Merritt & Ashby	553 0 0
Browne & Robinson	516 0 0
Ennor	492 0 0
Prince (accepted)	485 0 0

For five houses, Peckham, for Mr. J. M. McDonald. Mr. J. W. Reed, architect:—

Kelk & Co. (accepted)	£2,309 0 0

For alterations to old schools, Upper Caterham. Mr. Richard Martin, architect:—

Smethurst	£177 0 0
Simons	157 0 0
Scrivener (accepted)	140 0 0
Tooth	110 10 6

For alterations to No. 130, High-street, Croydon, for new post-office. Mr. R. W. Price, architect. Quantities by Mr. W. H. Barber:—

Hipwell	£720 0 0
Waller	697 0 0
Jarrett	676 0 0
Smith	627 0 0
Legg	595 0 0
Peskett & Taylor (accepted)	589 0 0

For fittings to a warehouse, Hamsell-street, City. Mr. H. Ford, architect:—

Crabb	£560 0 0
Brass	540 0 0
Young	520 0 0
Henshaw & Co.	485 0 0
Stimpson	458 0 0

For alterations to a warehouse, Hamsell-street, City. Mr. H. Ford, architect:—

Brass	£254 0 0
Crabb	235 0 0
Stimpson	234 0 0
Henshaw	194 0 0
Young (accepted)	187 0 0

For Wesleyan chapel and school, Cubitt-town. Mr. E. Hoole, architect:—

Hobson	£1,350 0 0
Harris & Wardrop	1,325 0 0
Ennor	1,248 0 0

For additions to residence at Cuddington, Surrey, for Mr. A. Hector. Messrs. J. Giles & Gough, architects. Quantities by Mr. C. H. Goode:—

Jocelyne (accepted)	£2,515	0	0

For alterations, additions, repairs, painting, &c., at 21, South-street, Manchester-square, for Mr. G. Cornwell. Mr. C. Bradley, architect. Quantities supplied:—

Scrivener & White	£784	0	0
Longmire & Burge	648	0	0
Ashwell	647	0	0
Stephens	627	0	0
Cairns	621	0	0
Harris & Sons	620	0	0
Simpson & Son	612	0	0
Brown (accepted)	598	10	0

For St. John's Church, Reading. Net amount, after allowing for present building. Mr. W. A. Dixon, architect:—

Manley & Rogers	£6,986	0	0
Wicks, Bangs, & Co.	6,589	0	0
Mann	6,455	0	0
Gibson Brothers	6,185	0	0
Nightingale	6,156	0	0
Staines & Son	5,876	0	0
Aitchison & Walker	5,595	0	0
Niblett & Son	5,437	0	0

For widening the River Medway, near Maidstone, for Navigation Company. Mr. M. Bulmer, surveyor:—

Fuller	£750	0	0!
Batch	529	0	0
Bugbird	500	0	0
Cole	439	0	0
Docwra	426	0	0
Hutson	297	0	0
Streeton	187	0	0!

For making up Raymouth-road for Rotherhithe Vestry:—

L. Etheridge	£1,175	0	0
Batch	1,099	19	0
W. Etheridge	1,096	19	8
Hobman (accepted)	1,075	0	0

For making up Wellington-road, Peckham, for Vestry of St. Giles's, Camberwell:—

Reed	£160	0	0
Hare	140	0	0
Harris	129	0	0
Batch (accepted)	114	0	0

For rebuilding the "Globe" public-house, Borough Market, Southwark, for Mr. Turpin. Messrs. Jarvis & Son, architects. Quantities supplied by Mr. T. Perry:—

Rider & Son	£3,135	0	0
Sheppard	2,970	0	0
Marsland	2,900	0	0
Hart	2,880	0	0
Tarrant	2,870	0	0
Henshaw	2,750	0	0
Downs & Co.	2,726	0	0
Eaton & Chapman	2,640	0	0
Thompson	2,623	0	0

For additions to St. James's Schools, Bermondsey. Mr. Hesketh, architect. Quantities supplied by Messrs. Franklin & Andrews:—

Legg	£1,420	0	0
Tall	1,260	0	0
Rider & Son	1,248	0	0
Arnold	1,199	0	0
Coleman	1,169	0	0
Tarrant	1,120	0	0
Kent	1,063	0	0
Downs & Co. (accepted)	996	0	0

For completing two pairs of villas, Lordship-lane, East Dulwich. Mr. T. Clarke, architect:—

Rooney, Brothers (accepted)	£300	0	0

For a detached house, Ninehams-road, Caterham, Surrey. Mr. R. Martin, architect. Quantities by Mr. F. Sparrow:—

Hunter (accepted)	£510	0	0

For mansion, &c., at Glynleigh, Sussex, for Mr. W. Taylor. Messrs. Bailey Denton, Son, & North, architects. Quantities by Messrs. W. Burnet and G. Stanham:—

	Mansion.	Two gate-lodges and two cottages.	Stables and clock-tower.
Chappel	£13,132	£3,893	£4,108
Trollope & Sons	12,926	3,637	3,875
Myers & Sons	12,753	3,619	3,797
Brass	12,713	3,274	3,472

For works at Henley, Surrey. Mr. R. Martin, architect:—

	Stables.	Pair of semi-detached cottages.	Agent's house.
Taylor & Son	£301	£300	£454
Peskett & Taylor	295	288	462
Ward	310	293	425
Thompson	316	245	455
Mason & Bristy	296	280	428
Scrivener	235	284	395
Smethurst (accepted)	290	266	348

For schools and teachers' residences, Upper Caterham, for the Caterham School Board. Mr. R. Martin, architect. Quantities by Mr. F. Sparrow:—

	Roofs slated.		Roofs covered with plain tiles.		Roofs covered with ornamental tiles.	
Scrivener	£2,767	add	£10	add	£21	0
Wright (Bros.) & Goodchild	2,750	deduct	50	deduct	30	0
Barnes	2,690	,,	32			—
Smethurst	2,690	,,	45			—
Taylor & Son	2,681	,,	17	,,	13	0
Jarrett	2,657	,,	70	,,	30	0
Simons	2,617	add	20	add	50	0
Thompson	2,575	deduct	50	deduct	25	0
Ward (accpd.)	2,608		—	add	15	5

TO CORRESPONDENTS.

Man of Kent (letter has been sent to the company).—H. K. W. (asphalte would probably answer the purpose, properly done).—J. L. (such arrangements for the formation of concrete walls were in use long before the date of the patent modes).—Y. C. C. (the objection to the present construction of water-closets may be obviated by having the seat so cut that the handle may be raised after the seat is down; or by use of a thin oval cover for the opening in addition to the ordinary flap).—J. H.—Rev. T. B.—E. H. L. B.—C. S.—W. D. G.—Mr. P.—E. B.—Dr. K.—C. B.—Dr. J.—H. H. B.—T. P.—Quarts-miner.—E. R. R.—H. W. T.—D. & Co.—E. H.—T. S. H.—R. G.—W. S.—J. K. & Co.—W. H. B.—W. J. S.—R. M.—W. B.—J. B.

Erratum.—In the account of Northamptonshire Excursion, last number, for "Dithlingborough" read *Irthlingborough*.

We are compelled to decline pointing out books and giving addresses.

All statements of facts, lists of tenders, &c., must be accompanied by the name and address of the sender, not necessarily for publication.

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CIVIL ENGINEER'S PUPIL.—A Civil Engineer, in extensive practice, principally as a Sanitary and Hydraulic Engineer, a Member of the Institution of Civil Engineers, is prepared to receive into his Office, at Westminster, a well-educated YOUTH who has a taste for Engineering Pursuits. Great advantages are offered for a thorough mastery of the profession, both practically and theoretically, and for future employment upon the completion of his articles. Premium required. References exchanged. Address, ENGINEER, care of Messrs. E. & F. N. Spon, Scientific Booksellers, 48, Charing-cross, London, S.W.

A VACANCY for a PUPIL, in a Builder and Contractor's Office. Premium moderate.—For particulars, address, 31, Office of "The Builder."

TO PARENTS AND GUARDIANS.
A FIRM of ARCHITECTS are seeking a PUPIL. A premium required, and a salary given after the second year, to a young man of energy and education.—Apply, by letter, to ARCHITECT, care of Mr. R. W. Dale, Stationer, New Market-street, Bradford.

A GENTLEMAN, with some years' experience on London and country railway, is prepared to MAKE or PLOT PARLIAMENTARY or other SURVEYS and LEVELS, to take out quantities, or to make all classes of drawings or tracings, either at home or elsewhere.—Address, B. Y. Post-office, Millbank-street, S.W.

TO TIMBER MERCHANTS.—The Advertiser, having had large experience in the Timber Trade, is open to undertake the SALE of TIMBER, on commission or otherwise, in Town or country.—Address, TIMBER, Post-office, Romford, Essex.

ENGINEER WANTED, by the Ferry Committee of the Wallasey Local Board, to Prepare Plans, Specifications, and Quantities, and to Take Charge of the whole Works for the contemplated Improvements at Seacombe and Egremont Ferries, on the River Mersey, consisting of Masonry, Landing-Stage, and Bridges at Seacombe; and a Pier, Inclined Slip, and Moveable Stage at Egremont.
Those engineers who have already had experience in such works will be preferred.
Applications, accompanied by testimonials, addressed to "The Chairman of the Ferry Committee," to be sent to the Offices of the Wallasey Local Board (Clerk's Office), Church-street, Egremont, near Birkenhead, not later than TWELVE o'clock at noon on THURSDAY, the 19th day of SEPTEMBER next.—By order,
T. SOMERVILLE JONES, Clerk to the said Board.
Public Offices, Egremont, 29th August, 1872.

QUEEN'S COLLEGE, GALWAY.—DEPARTMENT of ENGINEERING.—SESSION 1872-3.—The Matriculation Examination in the Department of ENGINEERING will be held on FRIDAY, the 18th of OCTOBER.

In this Department five Scholarships of the value of 20*l.* each, will be offered for competition, viz. two to the Students of the First and Second Years respectively, and one to Students of the Third Year. In addition to the Scholarships, three Exhibitions of the value of 12*l.* each, will be offered for competition among Students of the First Year.

The Examination for Scholarships of the First Year will commence on WEDNESDAY, the 23rd OCTOBER; of the Second Year, on THURSDAY, the 17th OCTOBER; and of the Third Year, on MONDAY, the 21st OCTOBER.

The Engineering School of Queen's College, Galway, is recognised by the Secretary of State for India as one of the Institutions in which Students may prepare for the annual competition for appointments in the Public Works Department in India.

Further information and copies of the Prospectus may be had on application to the Registrar.—By order of the President,

Sept. 10, 1872. T. W. MOFFETT, LL.D. Registrar.

ELY LOCAL BOARD of HEALTH.—To ENGINE-DRIVERS, &c.—WANTED, by the Local Board of Health for the District of the City of Ely, a PERSON, competent to drive, take charge of, and do ordinary repairs to two high-pressure stationary PUMPING-ENGINES, of 15-horse and 10-horse power respectively (working alternately), under the direction and superintendence of the Surveyor to the Board, to lay cast and wrought iron water-pipes, to fix hydrants and sluice-cocks, and make plumber's joints, in connexion with the water-supply of the city. The person appointed will also be expected to superintend the fire-engines, and to do any other description of artificer's work that may be required of him, so as to fill up his time when not employed in attending to the engines or laying water-pipes, &c. The wages will be 30*s.* a week, and a stoker is employed to attend to the fires; and a month's notice of intention to leave will be required.—Applications to be sent in writing, accompanied by testimonials as to character and competency, to the undersigned, before TWELVE o'clock at noon, on WEDNESDAY, the 25th inst. Preference will be given to candidates that have filled similar situations. The candidate appointed will have to enter upon his duties forthwith.—By order of the Board,

Ely, September 12, 1872. WM. MARSHALL, Clerk.

RIVER WEAVER NAVIGATION.—COUNTY of CHESTER.—To CIVIL ENGINEERS.—WANTED, a RESIDENT CIVIL ENGINEER, to SUPERINTEND the WORKS on the River Weaver Navigation. He must be acquainted with hydraulic engineering, and fully competent to carry out dock works and the extensive improvements already commenced, consisting of the construction of new enlarged locks and the widening and deepening of the navigation, and also to originate and complete any further improvements which may hereafter be required, and efficiently to maintain the existing works of the navigation. He will have to devote his entire time and attention to the duties of the office. The length of the navigation is about twenty-four miles, passing through the salt districts of Cheshire, and communicating with the River Mersey at Weston Point. Salary, 800*l.* a year, with an excellent house.—Applications, with testimonials, are to be delivered at this Office on or before the 28th instant; but it is requested that no personal or written application be made to individual trustees.

WM. WOOD BLAKE,

Clerk to the Trustees of the River Weaver Navigation.

Navigation Office, Northwich, September 2nd, 1872.

TO FIRST-CLASS DRAUGHTSMEN.

AN ARCHITECT requires a quick and clever DRAUGHTSMAN in his Office.—Apply, by letter, to M. I. B. A. care of Housekeeper, 3, Lancaster-place, Strand, stating terms and recent engagements.

TO QUANTITY SURVEYORS.

WANTED, a GENTLEMAN, thoroughly efficient. Preference given to one having had experience in builders' accounts. State age, terms, and references, to 61, Office of "The Builder."

TO ARCHITECTS, SURVEYORS, AND CONTRACTORS.

WANTED, by the Son of an Architect, a SITUATION as ASSISTANT. Has had seven years' experience, well up in all office routine, surveying, &c. No objection to go abroad.—Address, A. Y. Z. 7, Grafton-street, East, Tottenham-court-road, W.C.

WANTED, a CLERK, by a Builder, in the country. He must be perfectly correct at figures, a neat draughtsman, and in every respect trustworthy. — Apply, in own handwriting, stating age, names of references, and terms, to A. Z. Post-office, Leatherhead, Surrey.

TO ROAD SURVEYORS' ASSISTANTS.

WANTED, an efficient ASSISTANT, accustomed to accurate surveying, levelling, and plotting, and general office work.—Apply, by letter only, stating terms, age, and references, to SURVEYOR, 826, Office of "The Builder."

TO ARCHITECTS' ASSISTANTS.

WANTED, an ASSISTANT, well practised in Gothic and Italian detail, and qualified to undertake the management of the office.—Address, GEORGE BIDLAKE, Wolverhampton.

TO ENGINEERS' ASSISTANTS.

WANTED immediately, an efficient ASSISTANT, accustomed to setting out works, and thoroughly versed in the uses of the theodolite, level, &c. — Apply to S. S. 36 Wharf, Belvedere-road, Lambeth, S.E.

WANTED, in the Office of a Builder and Decorator, a CLERK, who is a good book-keeper, and well acquainted with the trade in all its branches. Not under 30 years of age. Moderate salary. State name, previous engagement, hours, and salary expected.—Apply by letter only, with full particulars, to W. S. Post-office, 227, Walworth-road.

TO BUILDERS' FOREMEN.

WANTED, immediately, a thoroughly practical FOREMAN for a country JOB. A Carpenter preferred.—Apply at 42, High-street, Camden Town, N.W.

WANTED, a first-class GASFITTER, BELLHANGER, and BRASS FINISHER.—Apply by letter, stating references, wages, &c. to A. B. Grosvenor Library, Chapel-street, Belgrave-square, S.W.

WORKING FOREMAN of JOINERS WANTED, who is a good manager of men, and can set out good work from architect's drawings, and keep correct account of material. Wages, 45*s.* per week. — Address, 53, Office of "The Builder."

WANTED immediately, a MAN, to Work a MOULDING and SQUARING MACHINE.—Apply, stating terms and reference, to Messrs. ADCOCK & REES, Contractors, Dover.

WANTED, TWO or THREE good CARPENTERS and JOINERS, at 7*d.* per hour. None but good hands need apply.—Address, Mr. SCRIVENER, Builder, New Barnet.

GRAINER and WRITER.—WANTED, a first-class WORKMAN, to go out to Australia, under an agreement, for permanent work. Good wages.—Apply by letter, giving fullest particulars, age, references, &c. to AUSTRALIAN, Deacon's, Leadenhall-street.

FOREMAN WANTED in a London Shop, where the chief work is in Galvanized Iron Roofing, Iron Buildings, and General Smithing. None but those having a knowledge of the business need apply, and a good knowledge of drawing be necessary.—Address, X. M. A. Deacon's, Leadenhall-street.

JUNIOR CLERK WANTED, in a Builder's Office. Must be competent to trace drawings and quick at figures.—Address, stating salary required and full particulars, to B. W. Miles's Library, Upper-street, Islington.

YEOVIL WATERWORKS. — FITTER WANTED. No one need apply who has not been employed as fitter by a Waterworks Company for the whole of the last twelve months. State age and if married. Wages good.—Address, The Manager, Waterworks, Yeovil.

TO BUILDERS AND OTHERS.

WANTED, EMPLOYMENT, by a good JOBBING BRICKLAYER. Wages, 7*d.* per hour.—Address, D. M. 12, Green-street, Marlborough-road, Chelsea, S.W.

WANTED, EMPLOYMENT, by a JOINER (Machine Hand), to WORK GENERAL JOINER, or Trying-up Machine, or Drive a small Engine, and work small Sawbench. — Address, J. P. 19, Richmond-street, St. George's-road, Southwark.

WANTED, EMPLOYMENT, by a Young Man, aged 26, as PLUMBER, PAINTER, GLAZIER, and PLAIN ZINCWORKER, or as a General Hand. Will make himself generally useful, and fill up time in anything required in the line of jobbing work. Wages no object.—Address, S. H. 1, Little York-place, Marylebone-road, W.

TO ARCHITECTS.

WANTED, EVENING WORK.—Designs from rough sketches (Gothic and Classic). Perspective, etching, and colour. Moderate terms.—Address, S. D. Post-office, No. 179, High-street, Camden Town.

TO BUILDERS AND CONTRACTORS.

WANTED, an ENGAGEMENT, as MANAGING CLERK to the above, by a Gentleman, who is a first-class estimator and surveyor, and possesses a thorough practical knowledge of the business. No objection to the country.—Address, No. 38, Office of "The Builder."

WANTED, a RE-ENGAGEMENT, by a thoroughly competent BUILDER'S CLERK. Practically acquainted with the trade. Accustomed to general supervision, and the management of workmen.—Address, No. 52, Office of "The Builder."

WANTED, a RE-ENGAGEMENT as WORKING SHOP FOREMAN, GENERAL FOREMAN, or to take Charge of a Job. Town or country. Joiner by trade. Good draughtsman. First-class references.—Address, W. S. 20, Doctor-street, Walworth, S.E.

TO BUILDERS AND CONTRACTORS.

WANTED, a RE-ENGAGEMENT as GENERAL FOREMAN. Twenty years' experience. First-class references. Town or country.—Address, DELTA, Mr. Russell's, 231, Walworth-road, S.E.

TO ARCHITECTS.

WANTED, a SITUATION, as JUNIOR CLERK, in an Architect's Office. First-class reference.—Address, M.B. 40, North-street, Pentonville-road, N.

WANTED, a SITUATION, by the Advertiser, in the WRITING, GRAINING, &c. as IMPROVER. Would not object to two years.—Address, W. C. Post-office, Weybridge.

TO BUILDERS AND CONTRACTORS.

WANTED, a SITUATION as a WORKING FOREMAN of PLASTERERS. No objection to country or country builders.—Address, W. B. 26, Palmerston-buildings, City-road.

TO BUILDERS, PLUMBERS, &c.

WANTED, a SITUATION, by a young Man as ZINC-WORKER or GAS-FITTER. Age 22. With good references.—Address, G. LAMPORT, 31, Little George-street, Bermondsey, S.E.

WANTED, a SITUATION, as BUILDER'S FOREMAN (Out or Indoor). Had several years' experience as a master builder, is a good joiner, and a fair draughtsman. Could keep books if required. First-class references.—Address, J. H. A. Rastall & Son, 81, Ebury-street, Pimlico.

TO BUILDERS.

WANTED, a SITUATION, as GENERAL FOREMAN, or FOREMAN of BRICKLAYERS. Is well educated, energetic, and first-rate tradesman. No objection to task-work. Good testimonials, and reference to present employer.—Address, No. 975, Office of "The Builder."

TO SAW-MILL PROPRIETORS AND BUILDERS.

WANTED, a SITUATION, in or near London, as SAW SHARPENER. Is a good hard wood sharpener. No objection to work a frame or bench occasionally. First-class references.—Address, A. B. 6, Duke-street, Stamford-street, Lambeth, London, S.E.

WANTED, by a Young Man, a SITUATION as THREE-BRANCH HAND. Can do gasfitting or plain zincwork.—Address, E. H. 23, Barbican, City.

TO MASTER PLUMBERS, BUILDERS, AND OTHERS.

WANTED, by the Advertiser, a Constancy as PLUMBER or THREE-BRANCH HAND. Can do plain zincwork. Town, country, or abroad.—Address, A. D. Plumber, No. 483, Liverpool-road, Holloway, London, N.

WANTED, by the Advertiser, a Builder's Clerk, a SITUATION in a builder's office. Used to making out accounts, measuring, estimating, superintending men. Good character. Age 34.—Address, A. B. 9, Essex-street, Mare-street, Hackney.

WANTED, by the Advertiser, a RE-ENGAGEMENT as FOREMAN of WORKS. Carpenter by trade. Several years' City experience. Unexceptionable references.—Address, E. B. 1, Alderney-road, Mile-end, E.

TO BUILDERS AND DECORATORS.

WANTED, by the Advertiser, age 23, son of a builder, a SITUATION in the office, or place of trust. Would not object to make himself generally useful. Fair draughtsman, understands the practical part of the carpentering, having served an apprenticeship.—Address, A. J. 118, Pentonville-road, N.

WANTED, by a practical Young Man (Bricklayer by trade), who has been in business for three years, a SITUATION as FOREMAN of BRICKLAYERS or INSPECTOR of WORKS to a Builder or Contractor. Used to all kinds of mill, warehouse, and Gothic work. Good references. Aged 26.—Address, J. C. 7, Frankhill-street, Oldham.

TO MASTER CABINET-MAKERS.

WANTED, by a thoroughly practical Man, of considerable experience, a SITUATION as FOREMAN or GENERAL MANAGER. Good draughtsman. First-class references given.—Address, X. X. 105, Stanley-street, Pimlico, London.

WANTED, by a thoroughly practical Man, an ENGAGEMENT, to take the entire Management of a Job. The country preferred. Just completed 2½ years' job. Well up in plans, setting out, measuring, &c. Good references. Carpenter by trade. Aged 40.—Address, B. B. Post-office, Norbiton, Surrey.

TO MASTER BUILDERS.

WANTED, by a respectable, well-educated Young Man, aged 23 (over four years' experience), EMPLOYMENT as JOINER (Improver). Would also assist at books if required. Moderate wages. Country preferred.—Address, A. E. 14, Richmond-grove, Richmond-road, Barnsbury, Islington.

WANTED, by the Advertiser, a thoroughly practical workman, a SITUATION, or JOB, as WORKING FOREMAN of PAINTERS. Many years' experience with first-class work and men in all the branches of the trade. Can measure and estimate.—Address, 972, Office of "The Builder."

WANTED, by a first-rate ARCHITECTURAL DRAUGHTSMAN, a RE-ENGAGEMENT. Satisfactory testimonials.—Address, 18, Office of "The Builder."

TO ARCHITECTS.

WANTED, by an ASSISTANT, a RE-ENGAGEMENT. Accustomed to prepare working drawings, details, &c.—Address, X. 6, Buccleugh-road, West Dulwich, S.E.

TO ARCHITECTS.

WANTED, by a Gentleman, a SITUATION in a London Office. Salary not so much an object as improvement.—Address, A. B. 1, Queen's-place, West-end, Hammersmith, W.

WANTED, by a CLERK of WORKS, a RE-ENGAGEMENT. Has been engaged in the erection and reparation of large churches, &c. and possesses very satisfactory testimonials and the highest professional references. Mason by trade. Aged 38.—Address, F. W. A. 51, South Molton-street, Hanover-square, W.

WANTED, by an experienced London Foreman, a RE-ENGAGEMENT as GENERAL FOREMAN, CLERK of WORKS, or take entire Charge of Job. Bricklayer by trade. Just completing a large job in the country. Good references, &c.—Address, A. N. care of Mrs. Cope, Upper Pearpoint-street, Sneinton, Nottingham.

TIMBER TRADE.—WANTED, by the Advertiser, a thoroughly competent Young Man, a SITUATION as FOREMAN and SALESMAN in either a Wholesale or Retail Mahogany and Timber Yard. Has a thorough working knowledge of the trade, also a good travelling connexion; quick at accounts; over seventeen years' experience; good character, &c.—Address, 909, Office of "The Builder."

TO ARCHITECTS AND SURVEYORS.

TEMPORARY ASSISTANCE rendered in the preparation of plans, &c. Sketch designs, or sets of finished working drawings carefully prepared from rough sketches or instructions. Terms moderate.—Address, X. Y. 49, Great Percy-street, W.C.

TO TIMBER MERCHANTS, &c.

THE Advertiser offers his Occasional or Permanent SERVICES to Timber Merchants, &c. to Assist them in Making up their Books and Accounts.—Address, D. M. care of Mr. Rait, 20, Queen's-terrace, St. John's-wood, N.W.

TO NOBLEMEN, GENTLEMEN, ARCHITECTS, &c.

THE Advertiser, who has been engaged during the past two years in superintending the erection of a nobleman's town mansion, is desirous of a RE-ENGAGEMENT. Is a good practical draughtsman, designer, perspective hand, and colourist, and having had considerable experience in all branches relating to the profession, offers his services with confidence. Satisfactory references.—Address, STANLEY, Post-Office, Vigo-street, Regent-street, W.

THE Advertiser, a CARPENTER, who understands Builders' Accounts, is a good penman and quick at figures, is open to an ENGAGEMENT as YARD FOREMAN, CLERK, TIME or STORE KEEPER. Would make himself generally useful. Well up in all the details of the building trade. Good references. Wages moderate. Aged 36.—Address, BIRKBECK, 18, Sheendale-villas, Richmond, Surrey.

THE Advertiser, who has just completed a large Church Restoration, desires a RE-ENGAGEMENT as CLERK of WORKS or GENERAL FOREMAN. Thoroughly up in all branches. Can trace, estimate, set out and measure up work, keep prime cost account. First-class testimonials, and reference to eminent architects and builders.—Address, B. 3, Hampton-place, Sheen-lane, East Sheen, S.W.

TO ARCHITECTS.

SITUATION WANTED, in an Architect's Office in Town or country. Good qualifications. Working drawings, details, and perspectives. Moderate salary.—Address, ASSISTANT, 4, Clegg-street, Oldham.

SIGN WRITING. — A superior SIGN WRITER (of private means) WANTS constant OCCUPATION for any part of the week as GENERAL WRITER (indoors), or would assist a young man or widow in the management of a decorator's business. The Advertiser has a thoroughly practical knowledge of the business, repairs, &c. For suitable occupation most economical terms may be arranged.—Address, by letter, A. Z. Boddington Library, Notting-hill-gate, W.

TO BUILDERS, DECORATORS, AND OTHERS.

RE-ENGAGEMENT as WORKING FOREMAN or otherwise, by a thorough Painter, Paperhanger, Glazier, and Distemperer. Twenty years' experience. Town or country.—Address, LEE, 9, Boundary-row, Blackfriars-road, London.

QUANTITY TAKER, MEASURER, and ESTIMATOR, of upwards of twenty years' experience, with a practical knowledge of building, and well acquainted with prices, offers TEMPORARY ASSISTANCE in town or provinces, upon reasonable terms. References if required.—Address, SURVEYOR, 25, Thornton-street, Brixton-road, S.W.

QUANTITIES and MEASURING.—A SURVEYOR of considerable experience in TAKING OUT QUANTITIES, MEASURING, WRITING SPECIFICATIONS, &c. can give TEMPORARY ASSISTANCE to Architects and Builders. Would have no objection to undertake the books and accounts of a Builder.—SURVEYOR, 128, Stanhope-street, Hampstead-road, N.W.

GRAINING and WRITING.—A first-class GRAINER and WRITER to the trade is open to a JOB.—Address, B. YOUNG, 186, Vauxhall Bridge-road, Pimlico.

PRIZE MEDALS.

FIRST-CLASS GRAINING, MARBLING, and DECORATIVE WORK, at Moderate Prices. Specimens can be seen at the Crystal Palace, near the entrance from the High Level Station.

Country Orders punctually attended to.

W. READ, 437, BRIXTON ROAD, BRIXTON, S.W.

CLERK of WORKS requires an ENGAGEMENT. Long experience and good testimonials.—Address, C. P. care of Mrs. Sayers, Maryland Point, Stratford.

TO BUILDERS AND CONTRACTORS.

CLERK.—WANTED, a RE-ENGAGEMENT as above. Good references. Aged 25.—Address, J. D. L. Post-office, Preston-street, Brighton.

CLERK of WORKS.—WANTED, a RE-ENGAGEMENT by a thoroughly practical and experienced Man.—Address, STAPLETON, St. John's Foundation School, Leatherhead.

TO BUILDERS.

BUILDER'S CLERK. — WANTED, an ENGAGEMENT, by a competent Party. Well up in all details and acquainted with the management of men.—Address, 905, Office of "The Builder."

TO BUILDERS, DECORATORS, &c.

A THOROUGHLY experienced GRAINER, WRITER, &c. is in want of an ENGAGEMENT. Competent to take the entire management of decorators' work. Town preferred.—Address, W. F. 6, Claremont-villas, South Norwood, Surrey.